

CHILD DEVELOPMENT

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PLACED IN INFANCY

HAROLD M. SKEELS¹

The mental development of children placed in foster homes is being studied coöperatively by the Iowa Child Welfare Research Station and the Bureau of Child Welfare. The present report is the first unit of a long-time study. As time progresses, children from infancy to six years of age at time of placement in foster homes will be included in order to determine changes in mental growth with changes in the environment. The unit now being reported includes only children who were under six months of age when placed in foster homes. The state program requires that a child be in the foster home at least twelve months before application for adoption can be made. The group includes all children for whom application for adoption was made during the fiscal year from February 1, 1934 to February 1, 1935 who had been placed before they were six months of age, a total of seventy-three children. These children have been in the foster homes from one to five years. The mean chronological age of this group at time of placement was 2.5 months. The children have therefore experienced essentially only the environment of the foster home.

All children have been given at least one intelligence test just prior to adoption. The Kuhlmann and Stanford Revisions of the Binet have been used as the standard measures of intelligence. Children under three and one-half years of age have received the Kuhlmann and those over that age the Stanford. The mean age of the group at the time intelligence tests were given was 24.4 months. Histories of both true and foster parents, including educational attainment, occupational status, and economic security, have been evaluated. In addition to these factors, Stanford-Binet intelligence tests have been obtained on thirty-nine of the true mothers.

As shown in Table 1 the average educational attainment of true fathers was 10.2; the figure represents the grade completed. The average educational

Table 1

Mean and Standard Deviation Comparisons of Education and Occupational Status of True and Foster Parents

Factors	True Parents			Foster Parents		
	Number	Mean	Standard Deviation	Number	Mean	Standard Deviation
Occupational status of fathers	54	5.8	1.34	73	3.5	1.37
Education of fathers*	42	10.2	2.25	71	11.5	2.87
Education of mothers*	69	9.4	2.15	71	11.7	2.67
Mid-Parent education*	42	9.8	1.90	70	11.6	2.61

*School grade completed

attainment of the true mothers was 9.4. The average mid-parent grade attainment was 9.8. Thirty-three per cent of the true fathers and 46 per cent of the

¹ From the Iowa Child Welfare Research Station, University of Iowa, Iowa City, Iowa. The writer wishes to express his appreciation to Dr. Mae Habenicht, Superintendent of the Bureau of Child Welfare, for her helpful suggestions and for her approval and encouragement of this study of foster children; to the Iowa Board of Control of State Institutions which has coöperated in making possible research studies of state wards; to Mr. H. A. Mitchell, Superintendent of the Iowa Soldiers' Orphans' Home from which the children reported in this study were placed; to Miss Marie Skodak, assistant psychologist of the Board of Control, who made a number of the examinations and who assisted in setting up this study; and to Dr. George D. Stoddard, Director of the Iowa Child Welfare Research Station, who made the study possible.

true mothers went no further than the eighth grade in school. A higher level of educational attainment is represented by the foster parents. The average grade attainment for foster fathers was 11.5 and for foster mothers, 11.7 with 11.6 being the average mid-parent grade level. None of the foster parents had had less than an eighth grade education. Fifty-five per cent of the foster fathers and 62 per cent of the foster mothers had at least graduated from high school.

Comparisons of occupational status for true and foster parents have been made on the seven-point classification of employed males used in the Census of the United States, Volume 4, 1920 (Reported by Goodenough¹). On this scale, Group I represents the professional occupations; Group II semiprofessional and managerial; Group III clerical, skilled trades, and retail business; Group IV farmers; Group V semiskilled occupations, minor clerical positions, and minor businesses; Group VI slightly skilled trades and other occupations requiring little training or ability; and Group VII day-laborers of all classes. On a basis of such comparisons, true fathers have a mean occupational level of 5.8 (Table 1). Forty-six per cent of the true fathers classify in the lowest occupational level, that of day-laborer; 66 per cent of the true fathers class in the lowest three occupational groups. The mean occupational classification of foster fathers is 3.5 and 74 per cent of the foster fathers class in the four highest levels. Over and above these contrasts in occupational status of true fathers and foster fathers, there is an even more marked differentiation in that within each occupational level the foster fathers represent the economically secure individuals, while within the same occupational levels the true fathers represent the economically insecure individuals.

The mean IQ for the thirty-nine true mothers on whom intelligence tests were available was 83.8. Of this group of thirty-nine mothers, fifteen had IQ's below 80 and were of borderline and feeble-minded levels of intelligence, the mean IQ being 70.7.

It will be seen from these comparisons that the level of true parents is very markedly below the level of foster parents. It may be stated parenthetically that at the time placements were made of the seventy-three children included in this study, the major basis for selection for placement was a clear medical record and physical soundness. Furthermore, selective placement was found not to be operative, that is, the child from a feeble-minded mother was as apt to be placed in a foster home of superior status as in a foster home of the lower occupational levels. Conversely, children with superior inheritance were placed in the lowest occupational levels of foster homes as well as the highest. Selective placement is therefore ruled out as a causal factor. It may be further stated that this inadequate procedure of matching children to homes no longer exists. A careful study of case histories is made by the Superintendent of the Bureau of Child Welfare, the superintendent of the orphanage, and a member of the Department of Psychology, before an assignment is made to a foster home. In this way the present policy is very definitely to match the abilities of the child with the opportunities of the home. However, the earlier method has furnished an invaluable source of data for measuring changes in mental growth in relation to environmental stimulation.

Results of psychological examinations made on these children in foster homes show the mean IQ of the group to be 115.3. This is definitely above average. Of the seventy-three children, twenty-six of them classed as of very superior intelligence; twenty-two of superior intelligence; twenty-four of normal or average intelligence; one at the dull-normal level; none at the borderline level; and none at the feeble-minded level of intelligence. Of the seventy-three children, 96.6 per cent class as normal or above. Such findings are significantly higher

¹ Goodenough, Florence L. and Anderson, John E.: *Experimental child study*. New York, Century, 1931, pp. xii, 546. (Appendix A, pp. 501-512).

than the expectancy from an evaluation of the histories of true parents which show them to be of the lower social, economic, and educational levels in society. A correlation of only $.09 \pm .11$ was obtained between the intelligences of children and true mothers (Table 2).

Table 2

Comparative Correlations between Child's IQ and
Education of True and Foster Parents

Factors	True Parents		Foster Parents	
	Num- ber	Correlation	Num- ber	Correlation
Mid-Parent education	42	$+.29 \pm .10$	70	$-.04 \pm .08$
Education of father	42	$+.23 \pm .10$	72	$+.01 \pm .08$
Education of mother	69	$+.13 \pm .06$	71	$-.10 \pm .08$
Mother's IQ	39	$+.09 \pm .11$		

The highest correlation was obtained between the intelligence of children and the mid-parent educational level of true parents which was only $.29 \pm .10$. Although correlation techniques show little relationship with education or occupational status of either true or foster parents, the fact yet remains that the level of intelligence of these children is higher than would be expected for children in their own homes whose parents were of comparable levels.

In making further comparisons of children's IQ's as relating to true parents (Table 3), a mean IQ of 115.5 was obtained for all children whose true mothers' IQ's fell at the borderline or feebleminded level (below 80).

Table 3

Comparisons of Children's IQ's with Education, Occupa-
tional Status, and Intelligence of True Parents

Factors Relating to True Parents	Chil- dren	IQ	
		Mean	Stand- ard De- viation
Fathers of occupational levels IV, V, VI, and VII	48	114.9	12.5
Fathers of occupational levels VI and VII inclusive	33	115.4	12.9
Fathers of occupational levels VI and VII and mothers with grade school education or lower.	17	111.2	11.9
IQ's of mothers (Mean IQ = 83.8)	39	116.7	13.0
Mothers with IQ's below 80 (Mean IQ = 70.7)	15	115.5	12.3

The mean IQ of this group of children from the mothers of lower IQ's was only one point lower than that of the entire group of children. Children whose true fathers classed in the two lowest occupational groups, showed a mean IQ within one point of the total group. Taking the children with low inheritance on both

sides, that is, with fathers of occupational groups VI and VII and with mothers of eighth grade education or less, the mean IQ was 111.2, or only 4.5 points lower than for the entire group.

Comparisons of children's intelligence with the occupational levels of foster fathers show an absence of relationship for children under two years of age. As age increases there appears to be a tendency for positive relationship (Table 4).

Table 4

Means and Standard Deviations of Children's IQ's in
Relation to Occupational Levels of Foster Fathers

Occupational Levels of Foster Fathers	Children			
	Num- ber	Mean Age, Months	IQ	
			Mean	Stand- ard De- viation
Groups I, II, III combined (all children)	39	26.4	115.7	11.4
Groups IV, V, VI, and VII combined (all children)	34	22.2	114.9	13.2
Groups I, II, III combined (children below twenty- four months)	24	16.3	117.1	11.7
Groups IV, V, VI, VII com- bined (children below twenty-four months)	26	16.9	118.3	11.5
Groups I, II, III combined (children above twenty- four months)	15	42.5	113.5	10.2
Groups IV, V, VI, VII (children above twenty- four months)	8	38.4	103.7	12.3
Groups I, II, III combined (children above thirty- six months)	9	52.0	112.1	12.5
Groups IV, V, VI, VII com- bined (children above thirty-six months)	4	48.8	98.3	7.3

Combining children from the higher occupational levels, including groups I, II, and III, and comparing them with those of the lower occupational levels, groups IV, V, VI, and VII, for children under twenty-four months (chronological ages between groups being comparable) gave mean IQ's of 117.1 and 118.3 respectively. For children over twenty-four months a difference of ten points in mean IQ was obtained in favor of the higher occupational levels. When only those children who were over thirty-six months at the time of examination were compared, the mean IQ for the higher occupational levels was 112.1 as against 98.3 for the lower, showing a difference of 13.8 in favor of the higher occupational levels. The numbers at these higher ages are so few as to make it impossible to draw any conclusions as to an increased relationship between foster-father occupational levels and differences in intelligence with increase in the age of the child. However, this tendency may be worthy of further consideration.

In conclusion, findings to date seem to indicate the following: (1) the mean level of intelligence of these children is higher than would be expected for children coming from the educational, socio-economic, and occupational level of the true parents; (2) no relationship appeared between the intelligence of true mothers and that of the children; (3) judging from the few cases available at the older preschool ages, a relationship between children's IQ's and foster fathers' occupational status seems to be present as the age of the child increases.

AN EXPERIMENTAL INVESTIGATION OF A METHOD OF
OVERCOMING CHILDREN'S FEARS

FRANCES B. HOLMES¹

This study was planned with the aim of trying out experimentally a method of overcoming fear in young children¹. An examination of actual research on this subject and of the books on child guidance which deal with the elimination of children's fears indicated a need for further experimentation under controlled conditions, as well as data from other sources. A brief summary of this literature follows.

Few studies in the elimination of children's fears under controlled laboratory conditions have been attempted. The study which is, perhaps, best known is that of Jones (12). Her subjects were seventy children three months to seven years of age living in an institution for the temporary care of children. They were tested for the existence of fears of the dark, being left alone, noises, masks, rabbits, frogs, rats, etc. The author reports that the children showing fear in these situations were selected as subjects, and various methods of elimination were tried. The various methods reported, however, appeared to be tried only on those children who showed fear of animals. These methods are briefly summarized below.

1. Disuse. This method is reported to have been employed with three children to whom the feared object was presented after intervals of two weeks to three months. The fear was still apparent.

2. Verbal Appeal. This method was used with one child of five years. It included ten minutes of conversation daily about the feared object, connecting it verbally with pleasant experiences, looking at a picture book of rabbits, and playing with toy rabbits. The live rabbit was again presented at the end of the week and the fear was still apparent.

3. Negative Adaptation. The non-verbal repetition of the feared situation. This method was used successfully with one child in overcoming fear of a rat. The child did not show a distinct positive reaction to the rat. The author makes the point that this method is apt to cause a simple indifference rather than useful acceptance. It also might result in increased fear.

4. Repression. The child is induced to cover up overt expressions of fear because of ridicule, teasing by other children or scolding by adults. One such case is described. This obviously results in the child hiding the fear rather than overcoming it.

5. Distraction. The offering of a substitute activity, such as talking to the child, while he approaches the feared object. Two such cases are described as successfully handled in this way. The author, however, remarks that distraction soothes a fear response but may fail to achieve a permanent reduction of the fear.

6. Direct Conditioning. Under this heading was included all specific attempts to associate with the feared object a definite stimulus capable of arousing a positive reaction. The author states that, "The hunger motive appears to be the most effective for use in this connection." This method is described in detail as it was applied to one child (11). While the child was eating, the feared rabbit was slowly brought nearer to the table, then placed upon the table, and finally it was brought close enough to be touched. This method was successful, but the author emphasizes that it requires careful handling.

¹ This study was conducted at the Child Development Institute, Teachers College, Columbia University during 1935. The author is indebted to Prof. Arthur T. Jereild for valuable advice and is grateful to Miss Kathern McKinnon, head teacher of the Three-Year-Old Group of the Lincoln School Nursery School, for her helpful cooperation. The author also wishes to express her appreciation to Prof. Lois Hayden Meek for providing the facilities which made this study possible.

7. Social Imitation. The two subjects whose behavior was described were allowed to share in the social activity of a group of children who were fearless when the feared object was introduced. This was successful in overcoming their fear. The author feels that this method is useful, although precautions are necessary as it is possible to induce fear in the previously fearless subject in this way. Jones repeats that the last two methods described were the only ones which met with unqualified success.

In discussing the elimination of fear responses Watson summarizes the work of Jones reported above. He concludes by saying, "The most successful method so far discovered for use in removing fears is the method of unconditioning or reconditioning" (16). He states that the use of this method in the case he described had a serious drawback, because he did not have control over all the meals of the child "Probably if the child had been stroked, petted, and rocked (sexual stimulation, thus leading to restraining of viscera) just as the feared object was presented, unconditioning might have taken place much more rapidly" (16).

It seems to this writer that the phrase "just as the feared object was presented" gives the clue to the element in the method of direct unconditioning, using either food or, as Watson suggests, sexual stimulation as the positive stimulus, which is its main limitation. For this method, as its description and actual use has shown, can only be used in overcoming fear of an object or animal which can be presented to the child while he remains passive, rather than learning actively to approach and enter the fear situation himself.

Watson at a later time (17) again stresses this method. When suggesting to parents a way of dealing with fear he says, "When all other methods fail (and he implies that they will fail) try this method Work it only once per day at noon time, when the child is hungry. Just as the child sees its food let someone show the rabbit as far away as possible." He then continues to describe the well-known re-conditioning technique. But one might question how this suggestion could help the parent whose child is not conveniently afraid of the rabbit, but is terrified when asked to enter the water. All children's fears are not of objects or animals by any means. Fears of climbing or walking on high places, fears of entering dark rooms, crossing streets, meeting strangers, entering the water, as well as the more intangible fears of imaginary dangers could hardly be treated in this way. It would be difficult from a practical standpoint alone to have a child eating (and both Jones and Watson emphasize the food as the successful positive stimulus) while walking along a high place or entering a dark room. It is also difficult to see how the concrete pleasant stimulus of eating could be associated with an imaginary bogey. Both Watson and Jones selected from the various fears discovered in their subjects only those of animals to use in their experiments, which could be presented to the child while he was undergoing the pleasant experience of eating. This does not take adequate account of fears wherein the child must act himself and enter the fear situation, such as entering a dark room alone, approaching and speaking to a stranger, etc. In overcoming the many fears of this type the child cannot be simply a passive creature. He needs to cooperate actively as he must learn to make positive movements toward the feared situation, rather than just sit still and learn to tolerate the feared object as it is brought toward him.

We would not consider that a child had overcome a fear of heights or a loss of support if he learned simply to sit inactive on a high ledge. He would have to walk along the ledge without hesitation or objection, and climb to high places with enjoyment. We would not agree that a child had no fear of the dark if he only slept in a dark room at night after he had been put to bed by his parents who turned out the light. Many adults who have kept their childhood fear of the dark, complicated by fears of imaginary dangers in the dark, uneasiness when walking on dark streets at night, and hesitancy when entering a dark house alone, are quite willing to sleep in a dark room.

Watson (17) offers unconditioning as the only means of eliminating this fear also. He says, "Start unconditioning at once. Put the child to bed at its usual time. Leave a faint light in the hall and leave the door open. Then every night after putting the child to bed close the door a little more and dim the light still more. Three or four nights usually suffice." This description makes this method seem both simple and sure. That it has been tried without success is indicated by parents' report of methods they used in attempting to overcome fear (9). It also ignores the factor of imaginary creatures, bogies, etc., feared when in the dark. This method also attempts to cope with the fear of the dark only as expressed by unwillingness to sleep in the dark. But a child with no fear of the dark should be able to enter a very dark room alone to search for a toy or walk all the way into the room and find the light switch without hesitation or uneasiness. In other words, the child must in many cases, actually learn new types of behavior, new skills, new ways of coping with the fear situation.

A child who is afraid of being on high places, if he is overcoming his fear in the completest sense, is acquiring new skills and abilities. He is learning how to maintain his balance while walking, how to rise from sitting to a kneeling, and from a kneeling to a standing position without falling, etc. These may not be necessarily entirely new, as he may already do these things while two feet from the ground, but he has to learn to do these at four or six or ten feet from the ground, which means making new adjustments. It is hard to see how fear could be thus overcome while the child is the passive object of direct unconditioning technique as it is usually described.

A summary of a number of methods that have been used in preventing and overcoming fears has been presented by Jersild (10). The data on which this discussion is based consisted of parents' reports of the fears they observed in their children, material gathered in interviews with parents in which they reported methods they had used in overcoming fear, and adults' reports of their childhood fears and ways in which those fears had been overcome. The most frequent factors reported in attempting to prevent the occurrence of fear were precautions taken to avoid contact with obvious fear stimuli, forewarning, anticipating the effects of maturation, and the promotion of skills. The outstanding elements in overcoming fears which had already developed were the factors within the child himself, including growth and experience, habituation, and the child's efforts to develop counteracting skills. Other contributing methods used were: one, aiding the child to escape when the situation is quite beyond him; two, efforts to explain, reassure, and promote understanding, and three, efforts to promote actual contacts and active coping with the fear stimulus. This third method was the most successful.

The many books on child guidance which discuss the problem of overcoming children's fears show a need for more objective data as the basis for suggestions made to parents of methods to use in overcoming fear. A number of these authors, including Gessell (7), Blatz and Bott (5), Langdon (14), Faegre and Anderson (6), and Thom (15), offer a fairly wide variety of practical suggestions for avoiding or preventing the occurrence of fear. But the suggestions are more meagre in dealing with the elimination of fears once they are established.

Many books limit themselves to one or two methods. The only two methods which are recommended on the basis of actual successful laboratory experimentation are those of social imitation and direct unconditioning. The authors who lay most of their emphasis on this method of direct unconditioning are Watson, Arlitt (2), Blatz and Bott, Faegre and Anderson.

The method applied by Jones and called "social imitation" is mentioned by several authors. Some of the statements as to its value, however, are contradictory. Watson (17) says "you can try letting other children play with the rabbit in front of the scared child. This does not work either."

While Anderson (1) states that "probably the most effective means of breaking up fear reactions, by and large, and over a period of time, is through the social group in which the child moves."

Several authors appear to over-simplify the ease with which fears can be removed. Thom (15) says "The objective fears are the most common, or at least, they are recognized most frequently by parents. Since it is usually not difficult to determine their origin these fears can soon be overcome." Gruenberg (8) makes the statement that "Many children are frightened by the touch of fur, or even of velvet; but this lasts only a short time and they soon learn to like the feel of soft, furry things, even of dogs and cats." This statement does not offer much aid to the parent whose child, over a period of two or three years, has crossed to the other side of the street to avoid passing a dog. That fears of animals often persist into adulthood is indicated in a study by Jersild and Holmes (10) which included adults' reports of their childhood fears as well as those they still had. Of these adults a large number mentioned that fear of animals, beginning in childhood, continued into their adult years. Arlitt (3) on the other hand, says that "All of them (fears) can be adjusted in a large measure by the use of the right method of conditioning." This statement probably over-emphasizes the ease of application and the degree of success insured by this method.

Others who suggest to parents ways of eliminating fear give what is probably an unwarranted amount of emphasis to the success of explanation or "reasoning" with the child. It has already been mentioned that Jones' method of "verbal appeal", which is very similar, met with no success. Thom (15), however, in discussing what he calls "subjective" or imaginary fears, says "Fear should be dispelled at the earliest possible moment by reassurance, which parents can give by reasoning with the child, and by giving him evidence that his imagination has played a trick on him." And later, he continues "Simple explanations often take away all unpleasant and fearful emotional reaction to any situation or experience through which the child is passing." Evidence presented in a study (9) mentioned earlier, of methods parents actually used in attempting to overcome fear indicates that reassurance and explanation, when used alone, met with but little success.

Many discussions of overcoming fear cite specific cases of a certain fear which has been overcome in some particular manner. For instance, in several books instances are cited of a child who overcame fear of dogs when his parents gave him a puppy to play with. This, however, cannot be applied by the many parents who, for various reasons, are not able to supply a puppy for their children. When one specific circumstance is mentioned in this way, it cannot be of much practical value to parents who are unable to reproduce the specific circumstance described. Also a method which worked in the one case cited cannot be expected to work with every other child.

There is another type of guidance material which might be briefly mentioned here, that based on the psycho-analytical approach to the problems of young children. Fear shown by young children is there interpreted as an expression of deep-seated conflict. The fear overtly expressed by the child is caused by a hidden fear, conflict, sense of guilt, etc. It is this repressed, hidden fear or conflict which must therefore be dispelled before the overt fear will be overcome. Melanie Klein (13) cites a case of a child of four years who had a fear of being left alone or abandoned by her mother "as a result of her desires to rob and kill her mother (caused by the fact that her mother was pregnant) she was afraid of being abandoned by her forever or of never seeing her alive again". This fear could only be dispelled, Klein believes, by analyzing this situation and bringing it to light. Other fears of concrete events are interpreted in the same way. "The unruly behavior of children while being bathed or having their hair washed is, as I have repeatedly found, nothing but a hidden fear of being castrated or having their own body destroyed (13). Here again the psychoanalyst's remedy for the fear just described is analysis. The parent, therefore, instead of attempting

to discover if she had carelessly allowed soap to get into her child's eyes during the hair washing, which would cause it to become a painful and therefore fearful experience to the child, can do nothing to overcome the fear herself. In this situation, as in all fear situations interpreted in this way, the only suggestion offered to the parent is to seek a psychiatrist.

Blanchard (4) makes an interesting comment which suggests one reason for the difficulties often encountered in overcoming children's fears. She states that psychiatric studies of the emotions of children "suggest that the parent-child situation may have influence in the development of emotional reactions or in prolonging or intensifying conditional emotional responses". She suggests that fear, once it has occurred, may continue for purposes of gaining satisfaction long after the fear has died out.

THE PURPOSE OF THIS STUDY

This study, as already mentioned, was planned to determine the usefulness of a particular method of overcoming fear in young children. This method, which consists in helping and encouraging the child to learn various ways of coping actively with the fear situation, has not been attempted under experimental conditions. It differs widely from the method of unconditioning in that it requires that the child be an active participant in the procedure and also because it is applicable to situations which require the child to enter the fear situation, rather than being limited to fears which can be presented to the child while he remains passive. It therefore seemed worth while to attempt to overcome several types of fears by using this method under experimental conditions and if possible in a variety of other situations. Although the method used in this investigation was essentially the one just described, the procedure included what might be considered as several contributing methods. These simply happened to be a part of the situation as a whole and were not considered to be of particular importance. These were verbal urging and reassurance by the experimenter, gradual familiarization with the fear situation, and play with various games at the end of each exposure.

It should be emphasized here that, though this approach was limited to experimental conditions, the method itself could easily be applied by anyone dealing with young children in the home and nursery school. It was not planned to limit the methods used to this one alone if the addition of another method seemed called for in any situation or with any child. The application of the method was not rigid, based on standard directions, etc., but very flexible and based somewhat upon trial and error procedure, as the experimenter varied or changed her approach as seemed fit. This seemed allowable as the study was considered to be mainly an exploratory one.

DESCRIPTION OF SUBJECTS, METHODS, AND PROCEDURE FOR DISCOVERING EXISTING FEARS

The subjects were twenty children attending the nursery school of Lincoln School, New York City, and ranging in age from thirty-nine to fifty-four months. All the children in the nursery school group were included as subjects, with the exception of one who was absent from the school because of illness.

In order to discover the existence of fears to be eliminated, the subjects were exposed to two fear situations. These were situations designed to discover the existence of fears of the dark and fears of height. These two particular situations were chosen because they both required active participation on the part of the child and because they were available. It was necessary that they be of a type that could be simply and easily presented under laboratory conditions. The situations also had to be arranged

in such a way that it would be possible to observe and record the behavior of the subject when exposed to them. And, finally, in order to make such experimental work with young children possible, these fear situations had to be such that a child could participate in them without realizing that he was being experimented upon.

These two situations, dark and height, were two of eight experimental fear situations designed and used by the author in a previous study (10). In this study 105 children were exposed to the eight following experimental fear situations; being left alone, sudden displacement, a dark room, a strangely dressed person, walking along a high board, a loud sound, a harmless snake and a large dog. The two situations selected for use in the present study will be briefly described presently.

The experimenter became well acquainted with each child on the playground and in the nursery before he was asked to participate in the experiments. When the child and the experimenter has thus established friendly relations, the child was invited to come and "play games" with the experimenter.

The experimental room, 16 by 10-1/2 feet, was partitioned off from a large room in the basement of the school building. It contained a small table and two chairs and also the apparatus for the High Boards, which will be described. As soon as the child entered this room he was seated at a small table and given a toy to play with. Some incidental conversation usually took place and the experimenter waited until the child seemed completely at ease before beginning the experiment. The first situation was then presented as follows:

HIGH BOARDS

Description of situation and apparatus:

Two ladders, one fastened to the wall and one standing in the center of the room, supported a board which could be moved so that it might be placed at distances approximately 2, 3, 4, 5, and 6 feet from the floor. Under the board mats were placed for protection. At one end of the board was placed a box of brightly colored toys.

The child's attention was called to the toys on the board, when the child showed an interest in them or expressed a desire for the toys he was taken to the apparatus and lifted up onto the other end of the board, which was always placed 4 feet above the floor for the first trial. When the child was standing on the board the directions were given.

Directions:

- a. Preliminary directions: "See how nicely you can walk across and get a toy."
- b. Urging and reassuring: "You can do it,...(name),...go ahead." If the child said, "I'll fall", etc., the reply was, "No, you won't fall, you can do it."
- c. Offer to accompany: "Then take my hand and walk across."

In each case the board was placed four feet from the floor for the first trial. If the child refused to walk across, or would walk across only with the help of the experimenter, then the board was placed at three feet for the next attempt. Then if the same behavior occurred it was placed at two feet for the next attempt. If the child performed without the experimenter's help on the board when placed at four feet from the floor, it was moved up to five feet, and if that height was accepted, then up to six feet. Between each trial the child was lifted from the board with the toy he had succeeded in obtaining, and was allowed to play with it for a few moments, before continuing. There were always enough toys in the box to provide a lure for several trials. Also it was noted that the very procedure of walking the board seemed in itself to be an incentive to action.

The second situation, Dark Room, was presented at intervals ranging from a few days to a month after the first experiment, and is described as follows:

Dark Room

The room used for this purpose was the experimental room itself. When the lights were turned out this room was not completely dark but as dark as the usual unlighted room in a house at night. After the child had taken one or two steps into the room the objects in the room (during this experiment the apparatus for the High Board was removed) could not easily be discerned, and he had to "feel" his way along as it were. A light chain was suspended from the light on the wall at one side of the room and toward the back. It was 14 feet from the entrance.

The child was brought from the playground by the experimenter as already described, and when they reached the large basement room from which the dark room opened, the experimenter suggested they have a game with a large red ball she was carrying. Then when the game was under way and the child appeared to be enjoying it, the experimenter maneuvered the child so that he was standing near the door to the dark room. She threw the ball toward the child but aimed it so that it went into the dark room instead.

Directions:

- a. Preliminary directions: "See where the ball went." (Pointing to the open door.) "Go in and get it and then we'll play ball again."
- b. Urging and reassuring: "It's in there. You can find it. Go ahead." If the child continued to refuse and it seemed evident that he would not enter the room, the examiner offered to accompany him.
- c. Offer to accompany: "Then we'll both go in and look for the ball."

It should be especially noted here that in each experiment the procedure allowed for four distinct steps; First, the preliminary directions; second, if the child made objections, urging and reassurance; and third, if the child continued to refuse, the experimenter offered to help or accompany the child. Then, fourthly, if the child still refused to perform, even with the help of the experimenter, the experiment was ended. This procedure is important as it is the basis on which the existence of fear was determined.

The experiments always took place during the children's free play period from 9 to 11 in the morning.

The behavior of the subjects in these two situations was recorded on a record blank, devised and used in the study previously mentioned, which consisted of a check list of their behavior occurring in each situation. The outcome of the experiment determined whether or not the child showed fear. Fear was defined, as in the previous study, as either complete refusal to enter into the situation or refusal to enter the fear situation until the experimenter had offered either to accompany or help the child.

The material recorded, however, was not limited to the items on the record blank. The experimenter recorded the child's verbal responses as well as any behavior he exhibited, either before or after the experiments, which seemed pertinent. She also recorded her own procedure.

When the existing fears of entering a strange dark room and walking along a board raised from 4 to 6 feet from the ground had been discovered, the experimenter was ready to attempt to overcome these fears. Of the 20 children exposed to the High Boards only two showed definite indications of fear as determined by the definition of fear just given. The remaining 18 children all walked across the board when raised to 6 feet, several of these however, by their general behavior, including vocal comment, manner of walking, facial expression, etc., indicated that they were apprehensive and not entirely at ease when walking the boards. However, the children selected as subjects for eliminating fear were the two who had shown outstanding signs of fear by refusing to walk the board when placed at 4 feet from the ground.

Of the 20 children exposed to the dark room 14 showed fear as determined by our definition of fear. The remaining 6 showed various degrees of hesitation, but finally entered the dark room alone. In this case, all the children were used as subjects in overcoming fear in order to see if the methods used were successful, how long it would be before all the subjects willingly entered and remained some time in the dark room without hesitation and without showing any overt signs of apprehension.

DESCRIPTION OF PROCEDURE USED IN ATTEMPTING TO OVERCOME FEAR OF THE DARK

The means used to discover any existing fears of the dark in these twenty children has just been described. The 14 subjects who showed fear, according to our definition, refused to enter the dark room in search of the ball and only did so after the experimenter offered to accompany them. Their refusals consisted of withdrawing from the doorway, attempting to pull the experimenter into the room with them, verbal protests and excuses, etc. Some typical verbal protests were, "I want the light," "It's too dark in there," "You come in with me," "I can't go by myself," "Cause it's dark," "Somebody may be in there," and so forth.

The parents of the 14 children who showed fear of the dark were asked in interviews, reported elsewhere, if they had observed fear of the dark in their children. The parents of six of these children reported that their children had shown fear of the dark recently. The other five parents said that their children were not afraid and would sleep alone in a dark room and would enter a dark room in their own home. Therefore the question might be raised here as to whether these children who showed fear of entering the dark experimental room could really be considered afraid of the dark, or only afraid of the dark strange room in an unfamiliar environment. However, it is equally questionable whether a child who sleeps in or enters a dark room in his own home, but shows fear of entering other unfamiliar

dark places, should be considered as unafraid in the dark. It is also true that the experimental room was not entirely strange to these children. They had all been in the room before when they performed in the High Board experiment, which was presented to them first, and none of them had, at that time, shown any overt signs of fear when entering the room. They had all had a chance to play with toys and games in the room before leaving, which should have created a pleasant association with the room. Also, none of the children showed any fear of the room itself after the experimenter had entered and turned on the light. Therefore it seemed allowable for the purpose of this experiment to consider that the children who refused to enter the dark room were showing fear of the dark itself.

When these 14 children who showed fear of the dark had been selected, the experimenter attempted to overcome their fear by using the following method; The chain of the electric light switch was lengthened by attaching to it an extension chain, on the end of which was fastened a very small phosphorescent pendant. The chain then was long enough to be within the reach of all the children. The phosphorescent pendant gave a slight glow that was visible when the child was standing within a foot or two. This chain was suspended in front of the center of a screen standing against the wall. It was in a position diagonally opposite the doorway toward the back of the room, and fourteen feet from it.

When the child and the experimenter approached the door of the room (the child had previously been told he was going to "play games") the experimenter asked him to go in and turn on the light. She explained to him where the light was and told him he could reach the chain. If he protested and refused to enter she said, "Then I'll go in with you and show you how you can find the light". Then they both entered the room (none of the children refused to enter when accompanied by the experimenter) and the experimenter lead the way over to the light. She showed the child the chain that was hanging in front of the screen, showed him how he could feel along the screen with his fingers in search of it. She also pointed out that he could see the shining pendant when he was near enough, and that this would help him find the chain. She then let the child pull the chain and turn on the light. Then he was asked to turn it off and watch the "little light" which shone in the dark. This gave the child a chance to be accustomed to staying in the dark, and to begin to participate by turning the light on and off. Then it was lighted once more and the child sat down at the table for a few minutes of play with one of several animal puzzles which all the children appeared to enjoy.

In this way the experimenter attempted to direct the child in finding his way around and orienting himself in the dark. Just before leaving the room the child was asked to turn out the light. The experimenter then usually said "Now you'll know where to find the light the next time you come in. You can remember that it hangs in front of the screen, and you can look for the little light at the end of the chain." This again emphasized to the child that he would be expected to make an attempt to cope with the situation himself.

This procedure was repeated with slight variations at each trial until the child entered the room alone. If when he entered he asked for help in finding the light the experimenter stood at the doorway, and directed him by saying "Try to find the screen first" or "Feel along the screen for the chain with your fingers" or "Look for the little light at the end of the chain." When the child found the light himself he was always praised with

some such words as "That's fine. You found the light all by yourself, didn't you." This procedure was continued until the child entered the dark room alone, without asking for help and without any hesitation, and succeeded in finding the light and turning it on without help. It should also be mentioned here that the method was varied or added to in any way that seemed required in order to adapt itself to the needs of a particular child or a specific situation. The only time an entirely different method was tried was when the example of another fearless child was used in the case of one subject. This case is reported in detail in the following discussion.

RESULTS

Of the 14 children who had shown fear of the Dark Room, 13 finally succeeded in entering the room alone and unaided and in finding the light. One succeeded in entering the Dark Room without hesitation and searching for the light several times without any signs of fear, but did not succeed in actually finding it. This was the same child whose fear of height was overcome. Since she had been taken from the nursery school group so many times for that experiment it was decided to limit the number of her exposures to the Dark Room and so this experiment was not completed. The number of different exposures required per child by the 13 whose fear was overcome ranged from three to seven. The remaining 6 children who had not shown fear of the dark, in that they were willing to enter the Dark Room at the first exposure, although some did show signs of hesitation and asked for help, etc., were also exposed to this procedure until they also entered and found the light without help, or any signs of fear. Five of these children did this, one was absent from the nursery school after three trials and so could not complete the experiment.

In order to illustrate the way in which this method was applied and how it worked successfully it seems best to give some examples. These summaries are taken from the actual record blank. They are not a reproduction of the complete record but include only the items of behavior checked, the child's language, some of the experimenter's directions and comments and any other relevant material. The cases selected and presented here are those which illustrate most clearly the change in the child's behavior from evident fear of entering the dark room alone at the first exposure, to complete willingness to enter without any overt signs of fear at the last exposure.

SUMMARY OF ALLAN'S PERFORMANCE IN THE DARK ROOM

A BOY OF FORTY-SEVEN MONTHS OF AGE AT THE BEGINNING OF THIS EXPERIMENT

First Exposure, March 15, 1935.

When the ball rolled into the dark room, Allan entered about three steps. He then came out again and when the experimenter urged him to enter, he made verbal protests as follows; "There's no light. Hey, I want the light." "Hey, light the light," and "You come with me." Experimenter then entered the room with him and the ball was found.

Second Exposure, March 29, 1935.

This time, experimenter asked Allan to go in and turn on the light. He stood at the door and said, "Are you going to close the door?" Experimenter; "No, I'll stand here by the door." He then entered slowly two or three steps and then came out again saying, "I can't. You come with me."

Turn the light on." Experimenter then entered room with him and showed him where the light was hanging down in the center of the screen. She also pointed out the small phosphorescent light at the end of the chain and explained that it would help him to find the chain. Allan seemed delighted with it and pulled the light on and off five or six times. He then stood in the dark, moving the light around in front of his eyes saying, "Isn't it beautiful." After he had played with a puzzle and was ready to leave, the experimenter asked him to turn the light off. He did so and again moved the lighted pendant around in the dark saying, "Look at the shadows." He then left the experimenter and walked in the dark over to the door and opened it.

Third Exposure, April 9, 1935.

Allan stood at door of dark room and said, "You come too." He took two or three steps into room and came out again and took experimenter's hand trying to pull her in with him. Experimenter explained that she would stand at the doorway while he looked for the light and that if he could not find it she would come in and help him. He then walked about half way into the room and stopped saying, "You come too." Experimenter then entered with him and showed him where to find the light chain. He turned it on and again showed great interest in the little light at the end of the chain. Turned light off when he left.

Fourth Exposure, April 25, 1935.

Allan entered the dark room without objection saying, "Where is the light?" Experimenter reminded him that it hung in front of the screen. He continued to walk into the room saying, "You come with me" and then, "Shall I walk slowly?" and "If I don't find it, then what?" Experimenter explained, "If you can't find the light I'll come in and help you. But see if you can't find it yourself this time." Allan then searched for the light and finally found it for himself. Experimenter praised his performance. He turned the light off when he left.

Fifth Exposure, May 5, 1935.

Allan entered dark room this time without hesitation or objection. He said "Shall we walk slowly or fast?" When he reached the wall he said, "I'll feel along here." (for the light chain) He found the light and turned it on. After playing with the puzzle, he turned out the light and turned it on. He turned out light when he left saying, "And I'll find it the next time, too."

This record illustrates, in the fifth exposure, how the child was making an evident attempt to handle the situation when he said "I'll feel along here," as he reached for the light chain. His pleasure in his accomplishment in entering and finding the light was evidenced by his remark "And I'll find it next time." In this way, when once he learned to find his way through the dark, his fear disappeared.

Another record, follows:

SUMMARY OF ELLEN'S PERFORMANCE IN THE DARK ROOM
A GIRL OF FORTY-SEVEN MONTHS AT THE BEGINNING OF THE EXPERIMENT

First Exposure, March 14, 1935.

When Ellen was requested to enter the dark room in search of the ball, she stood at the entrance protesting, "It's too dark. I don't like to go far in places where it's dark. I can't see it in darkness," etc. The experimenter finally entered the room with her and the ball was found.

Second Exposure, March 22, 1935.

As Ellen approached the dark room she said, "I don't want to play ball." The experimenter then said, "We'll go in and play some games then. You can go in and find a game on the table." This is an example of how the general procedure was varied to suit a particular case. Ellen stood at the doorway and refused to enter saying, "I can't, it's too dark. I can't see." Experimenter then entered the room with her.

Third Exposure, April 9, 1935.

When the experimenter requested Ellen to turn on the light, she entered about three steps into the dark room and then stopped saying, "It's too dark, I can't see it." She then came out again, and said, "I can't see. I couldn't find it." Her voice sounded tense and distressed. The experimenter then entered the room with her and showed her where to find the light. She turned it on herself and when leaving, turned it off at experimenter's suggestion.

Fourth Exposure, April 10, 1935.

When experimenter asked Ellen to enter and turn on the light, she said "All right" and walked in alone without hesitation. She went over to the wall where the screen was standing and felt along the screen saying "Is this it?" "Is this it?" The experimenter directed from the doorway by offering suggestions such as "Move that way a little more, Ellen," etc. She finally found the light and turned it on herself. She was praised for her performance.

Fifth Exposure, May 1, 1935.

Ellen entered the room without hesitation or objection. As she searched for the light she called out to the experimenter, who stood just outside the door "Over this way?" "A little further?" "Over this way?" Experimenter gave one or two directions and she finally found the light and turned it on.

Sixth Exposure, May 8, 1935.

Ellen entered the dark room without hesitation and walked over to the screen saying, "This way - a little further this way?" Then before the experimenter could answer her she reached the light and turned it on, calling out, "Here, I got it." Then turned and smiled appearing very pleased.

This record also shows how once the child has acquired skill in dealing with the situation the fear disappeared. This child's first reaction to the dark was "I don't like to go far in places where it's dark." But this

gradually changed and at the end of six exposures she entered without hesitation and searched around in the darkness until she found the light.

It should be emphasized here that it is important that the light switch should be at the back of the room. If it is right by the doorway then the child does not need actually to enter the room, but can turn on the light from the doorway thus lighting the room, removing the fear stimulus, and avoiding any participation in the situation. But if the light is placed near the back of the room so that the child is required to walk into the dark and search around for it then he is really learning to cope with the dark.

That the children appeared to make definite attempts to remember and carry out some of the suggestions made by the experimenter to help them find the light is illustrated by their comments such as; "Is it here? Is it in this section (of the screen)?" "I am feeling the screen," "I feel the screen, I found it (the light)" "I saw that little tiny light (the phosphorescent pendant)," "Where are you, Mr. Light?" "I will see a white thing." "I touch the wall, I find the screen" "Am I in the middle of the screen?" One child volunteered as he walked toward the experimental room, "Now I'm going to remember where in your room when I see the little light thing." And another showed the experimenter how he felt along the screen and found the light saying, "I did it just like this." Another child said as he left the room at the end of one trial "Next time I'll remember where that little light will be. All right?" And another child, "I'll know where it is next time", and another "The next time I'm going to do it all by myself."

A child whose parents had been quite disturbed by his continued fear of the dark at home learned to enter the dark room without hesitation in three exposures. After he had successfully found the light and was playing at the table with a puzzle he stopped in his play, looked over at the light chain and then at the experimenter and said with a wide smile, "I know where the light is".

These examples all present evidence that factors within the child himself supply a potent element in the process of eliminating fear. These children all showed an active interest and cooperation in the procedure. This is probably a factor of the greatest importance in the elimination of children's fears.

The example of the fearless behavior of another child did not appear to be of much use in the one case where it was tried. This child, Paul, aged forty-one months, did not appear to be making any progress in learning to enter the dark and so after the third exposure another child was introduced into the situation. This child entered the dark room and turned on the light while the fearful child watched. But the next time Paul came to the dark room he refused to enter as before. At another trial the fearless child entered again, and again Paul refused. Then the other child volunteered to go in with Paul saying, "You stay with me and I'll show you." Paul entered willingly when accompanied by the other child. But a week later he again refused to enter alone. This exposure and the following one in which he finally performed alone are summarized below.

Sixth Exposure, May 1, 1935.

Paul enters room slowly - goes in about three feet and stops. Then comes out again. Stands at doorway and makes verbal protest; "I can't, I can't

find it." "I can't." His voice sounds tense and distressed. Experimenter offers to accompany child and shows him the light chain. He turns light on and off several times. Then experimenter turns light off again and walks to the door with Paul. She says, "I'll stand right here and you can walk over to the light just as we did a moment ago and turn it on yourself." Paul does so. Experimenter, "Now you'll know how to find the light when you come in next time."

Seventh Exposure, May 3, 1935.

(Note) Room darker than usual as light in adjoining room not on.

Paul enters room at experimenter's request without hesitation or verbal protest. He walks over to the wall near the screen and feels for the screen saying, "I can't find it." Experimenter directs him saying, "Feel along the wall until you come to the screen." Paul finds chain and turns on light - then looks at experimenter and smiles. Experimenter praises him. This record suggests that the experimenter's procedure in the Sixth Exposure where she first helped him to find the light and then turned it out and let him immediately walk alone from the doorway over to the light, thus for the first time finding his way alone through the dark, was more successful in overcoming fear than the example of another fearless child. However, his willingness to enter the room alone at the Seventh Exposure may have been caused by the cumulative effect of the procedures used in all six trials, including that of the example of another fearless child.

The data presented here do seem to indicate definitely that this method was successful in overcoming fear of this specific dark room in these thirteen children who had previously been afraid. Although the procedure may have been varied slightly at times, when the experimenter changed the wording of her directions as it seemed desirable, the method remained the same throughout (except in the one case just cited). The method was essentially that of showing the child how he could find his way through the dark, in other words he acquired the ability to cope with his fear.

There is, however, an obvious criticism which can be made of these data. The experiment did not go far enough. It had been planned originally to discover if these children, who had overcome their fear of the dark room specifically, had also overcome fear of the dark in other surroundings. There were six children whose parents reported they showed fear of entering dark rooms in their own homes. It would have been of interest if the experimenter could have observed whether these children were now willing to enter such dark places in their own homes, and this had been the intention. However, this plan proved to be impossible to carry out, for the present experiment was completed near the end of May, and at that time it did not become dark until some time after these children had been put to bed at night. Therefore there was no way in which the experimenter could observe how the children would behave in a dark room in their own homes. Neither was there any other room available in the nursery school which could be artificially darkened in the same manner as the experimental room. For this reason, the results on this point had to remain inconclusive.

However, in spite of this it remains true that encouraging the child to enter into the feared situation and participate actively in learning ways of coping with the fear actually did succeed in overcoming this specific fear in these children. Therefore it seems allowable to suggest that this method might be used successfully by parents and others who deal with the fears of young children. It has the advantage of being simple and easy to

apply.

DESCRIPTION OF PROCEDURE USED IN ATTEMPTING TO OVERCOME FEAR OF HEIGHT

As already mentioned the procedure consisted in aiding and encouraging the child to learn ways of coping with the feared situations by actively participating in them. With this in mind, the experimenter varied her application of this method to suit the two quite different fear situations.

The procedure as it was applied in the case of fear of walking the high boards was as follows; The board was placed at 4 feet from the ground for the first trial. The two children who showed fear were both fearful at this height. When the child still refused to walk across the board alone the experimenter offered her hand and let the child walk across the board holding to her hand. This gave the child a chance immediately to participate in the fear situation. Then the board was moved down one foot, so that it was 3 feet from the ground. The child was then asked to walk across by himself. If the child did so he was allowed to walk across at this height several times, thus learning to cope with the situation when the fear stimulus was somewhat reduced. When the child appeared to be able to walk at this height without fear, that is, without hesitating or asking for help, the board was raised again to 4 feet and the experimenter suggested that he walk across by himself. If the child had refused to walk at 3 feet the board was moved down to 2 feet and the same procedure followed.

In each case the experimenter gave the minimum amount of help. The entire emphasis of her attitude was on the child coping with the situation himself. Each time the child performed alone he was praised in some such terms as "That's fine. You walked across all by yourself, didn't you." Each time the child reached the end of the board he was allowed to take a toy from the box and play with it for a few minutes, before performing again. This provided a lure in the form of a pleasant result of each trial, but in the case of the child whose fear was overcome the records definitely indicate the act of walking along the boards successfully was of more interest to the child than the act of getting a toy. There was no previously determined number of trials set for each exposure but the experimenter terminated each experiment before signs of fatigue were apparent. At the end of each exposure the experimenter told the child that he would be allowed to return some other day.

This procedure was followed with all the subsequent exposures. Each time the child walked across the board alone at one height it was moved up one foot higher until it reached the maximum height of 6 feet from the ground.

RESULTS

This method was successful in overcoming the fear of one of the two children on whom it was tried. It was unsuccessful with the other child, even when combined with the method of "social imitation" or examples of fearlessness shown by other children.

In order to illustrate the gradual overcoming of this fear in child A, a girl who was 39 months old when the experiment started, it seems best to give excerpts from the summaries of the records taken at the time. These excerpts give a much clearer picture of how the method was applied and its results than could be given by just a general description. These summaries

are not a reproduction of the actual record sheet, but were taken from the records in the same manner as those presented in the Dark Room experiments.

In the following summary some of the records of the eleven different days on which this child was exposed to the high boards are omitted. This was done merely for lack of space. The records which are presented are the ones which appear to show most clearly the various stages of the child's progress in overcoming this fear. The numerals indicate the height at which the board was placed. The letters indicate the number of trials, a being the first, b the second, etc.

SUMMARY OF CHILD A,
A GIRL 39 MONTHS OLD AT THE BEGINNING OF THE EXPERIMENT

First Exposure, February 26, 1935.

As Jean was lifted to the board she said, "I'll fall, fall." "I don't want to" etc. in a whining, crying tone of voice. Reached out toward and held on to assistant, knelt on board and refused to stand up until experimenter offered to hold her hand as she walked. Finally walked across by herself slowly and carefully. Praised for her performance.

5b Jean watched board being moved up to five feet and said "Is it higher now; I don't like it higher." Experimenter, "Yes, that's the way we play this game." Jean said, "I just get one (toy) that's all," then, "I don't like it so high. Why don't you put it down here?" Experimenter then said, "When you get up there I'll hold your hand as you walk if you like." Jean made no further objections and was lifted to the board. She held to assistant when standing on board, then experimenter offered her hand and Jean walked across holding to experimenter.

5c When asked to walk again Jean said, "I don't like it so high." This objection was ignored. She then allowed herself to be lifted up. When standing on the board she made a slight movement toward experimenter. Then walked across by herself without any urging. She started to walk slowly, but then she began walking at a normal pace and seemed much more at ease. Praised.

5d Made no objections this time and walked across at normal pace. Praised by experimenter.

5e Said, "Now what shall I do?" and walked without hesitation, at normal pace.

5f Same.

5g "I want something else." Walked without hesitation.

Note: The last three times Jean walked the 5 foot board she made no movement toward the experimenter to ask for help and walked at a normal pace. She seemed entirely at ease. As she was leaving the room the experimenter asked her to come back for more games tomorrow. She nodded, saying, "Uh huh," then looked up at the board and smiled, saying, "Way up there?" Experimenter, "Yes," then Jean grinned broadly.

Fifth Exposure, March 19, 1935.

After finishing the puzzle, Jean said, "Now I'd like to play on the board." Looked at board, said "That's so high," and walked across without hesitation.

5b Looks at board, grins, says, "Now they put it up there." walks without hesitation.

6c Jean said, "I want another toy," smiled and ran to board. The board

was, by mistake, not put in place quite firmly as Jean stood on it. She held momentarily to the assistant. Then she started to walk and the board shook slightly. Jean looked uneasy and started to bend her knees as though to sit down and looked at the experimenter. Experimenter reassured her saying, "You're all right, Jean." She then stood up and took two or three steps and the board shook again. She bent her knees as before and the experimenter again reassured her. She took a few steps and this happened a third time. Then she walked to the end of the board and continued to stand while she leaned over to take a toy.

6d In spite of Jean's definite uneasiness when the board shook she made no objection when asked to walk the board again and smiled, saying, "Shall I get the truck or the elephant?" This time the board was adjusted firmly and did not move. She walked across by herself slowly and carefully taking small jerky steps but did not bend her knees or attempt to sit down as before.

6e This time Jean ran to the chair smiling, and as the assistant started to lift her up she cooperated by giving a jump from the chair. Walked across slowly and very carefully.

Seventh Exposure, April 26, 1935.

4a Walks at normal pace and when reaches box of toys leans over with knees straight, instead of crouching, to reach a toy.

5b "Now I want another one." Walks across with long, steady steps and bends over with knees straight when taking a toy.

6c Walks across with long steps. Stands at far end swinging arms back and forth and completely at ease before she takes toy.

6d "Now I want sompin else." Walks across as in 6c.

6e "Now I want another toy." Walks with long, firm steps. When reaches toys she takes one and turns around (without suggestion) and starts back to the other end. Then sees that assistant is not there to take her down - stops, opens mouth, says, "I'm afraid up here." Then turns around again and walks back to where assistant is standing, who takes her down.

Eighth Exposure, April 29, 1935.

6a Note. (This time it was decided to begin with the 6 foot board instead of starting at 4 feet and gradually increasing the height. This was done to see if any fear would occur when the child was placed immediately 6 feet from the ground without any preliminary graded approach.)

Jean goes over to board without any suggestion. Walks across at normal pace with firm steps, takes a toy and says, "I want to walk back again." Turns around and walks back to the other end and waits there until assistant comes to take her down.

6b Goes to board without suggestion. Walks across with long, firm steps. Stands by box of toys swinging arms back and forth and chanting "Which toy shall I take, which toy shall I take." Appearance of complete confidence and ease. Then takes toy, says, "I want to walk back again," and turns and walks back to the other end.

The two following exposures differ from the previous ones in that the apparatus was moved from the experimental room and set up on the nursery school playground. This was done in order to discover if the lack of fear now shown by this child would carry over to a different environment or whether the fear had been overcome only when the child was performing in the experimental room.

The apparatus was placed on the playground near the jungle gym so that the board, raised to 6 feet, was secured at one end by the top rung of the jungle gym and at the other end by the ladder already described. The board was thus running out at right angles from the jungle gym.

The situation thus arranged could not be controlled as it had been in the experimental room. That is, other children were present and many made comments about the apparatus. Although no other child was allowed to walk the board many of them climbed up the ladder before the board was set in place and jumped off on to the mats. Jean observed all this in that she stood near by watching. The summary of these two exposures follows:

Tenth Exposure, May 17, 1935.

The high board apparatus is set up on the playground. As soon as it appears the children crowd around and ask many questions. These include children of the 4 year group as well as the 3 year group. Jean is nearby watching but does not make comment.

Another child asks workman why he put the mats under the ladder. He replies, "That's for you to fall on." Ladder is placed near jungle gym but board is not put in place yet in order to prevent other children from walking board. Children of 4 year group climb ladder and jump off backwards on the mat. There is much talk about falling, the possibility of the ladder tipping, etc. Jean watches and appears to hear all this.

A boy climbs up ladder and jumps off backwards. When he falls on to mat he hurts his back and starts to cry. Teacher rubs his back. Another 4-year-old child asks, "Does it hurt?" "Are you hurt bad?" etc. Jean seems to observe all this. Child soon stops crying and then leaves. Other children of the 4-year-group climb ladder.

Finally all children have left playground except Jean and one other. Board is put in place. Jean is told she can have the first turn.

6a When experimenter invited Jean to walk the board she made several objections and ran aimlessly around the playground. This appeared to be temporary negativism as she finally went to board and made objections to being lifted up, saying, "I could go up to that jungle gym." Walks across board and talks about jungle gym. Walks with slow, slightly uncertain, jerky steps. Then turns without suggestions and walks back again.

6b Plays with toy a moment and says "Am I going to have just one turn today?" Goes to board and walks as before, with slow, jerky steps.

Eleventh Exposure, May 20, 1935.

Apparatus was set up on the playground. Jean was taken back to the nursery school room by mistake, then returned to playground after other children had left. Ran to experimenter and said, "Are we going up there?" Grins. "Who's going to take me up there, you?" This time no toys were placed on the board. Jean walked without hesitation, taking long, firm steps. She turned around when she reached the other end and walked back again, then turned and walked again and finally repeated this a third time. Her manner indicated complete self confidence and ease.

The last records indicate that once the child had lost her fear in the one specific situation of the experimental room, she also showed no signs of fear of height, as measured by walking a board placed 6 feet from the ground, in a quite different situation. It is particularly interesting to

note that in spite of the fact that she probably heard other children talking about falling and saw one child fall from the ladder and cry, this did not appear to influence her behavior to any appreciable extent. She walked the board without objection or any observable signs of apprehension, although during the first exposure on the playground she walked with slow and slightly jerky steps. But during the second exposure she walked back and forth across the board three times, each time taking long, firm steps and seemed completely at ease.

The result of this experiment with this one child indicates that the method used here can be successful in overcoming this type of fear, although this does not imply that it will always work with every child. The summaries of each exposure illustrate the gradual change in this child's behavior from real fear when on the board at 4 feet, shown by whining, "I'll fall, fall," and holding to the experimenter, kneeling on the board and refusing to walk without help, to walking 6 feet from the ground with complete confidence. The records also illustrate her increasing skill in maintaining her balance, both when walking and when leaning over to take a toy. They also show that as her ability to cope with the situation increased her interest and enjoyment in the procedure increased also, indicated by performing without waiting for the experimenter's suggestion and verbal comments such as, "Now I'd like to play on the board," (fifth exposure). She also varied the procedure, such as walking over to get the toy and then turning around (learning a new skill) and walking back again, (seventh exposure). The first time she did this she showed some fear, but on the next exposure she repeated it, without suggestion from the experimenter, and seemed to enjoy it.

The results of this experiment would be more conclusive if it had been possible to expose this child to four or five other situations designed to discover if the lack of fear shown when walking a board 6 feet from the ground in the experimental room and on the nursery school playground would carry over to performing in other types of high places. It would also have been better if the child could have been encouraged and helped to increase her skill and ability in climbing at the same time to discover whether her lack of fear when on a high place plus skill in climbing would enable her to perform with ease on the highest rungs of the jungle gym. But this was not possible because of the limited amount of time available.

There is one other point that might be mentioned here. The criticism might be offered that the child was not really afraid of high places in general, but just showed fear in this particular situation because it was new or strange. If this had been the case then when she finally performed on the board at 6 feet she would have done so not because the fear of height had been overcome, but because she had become accustomed to the new situation. That this was not the case is shown by the accounts of her general behavior in the nursery school environment. These reports, written by the nursery school teacher who had particular charge of her and knew her best, include descriptions of definitely fearful behavior on the playground equipment, especially those requiring climbing and balancing ability, such as the jungle gym and the rocking board. They particularly mentioned her insecurity in climbing, and her poor muscle coordination which caused her to fall often when she was running on clear level ground. These facts suggest that Jean probably needed to increase her skill in walking and balancing on high places before her fear could be overcome. This was what the experimenter's method attempted to do. Therefore the fact that she finally showed no fear of walking on a board raised 6 feet from the ground indicates that she had probably acquired a greater proficiency in these motor skills.

That this method or combination of methods cannot be expected to be always successful in overcoming this fear in every child, is shown by its failure when used with the other child who was afraid on the high boards. This

was a boy, James, 51 months old. The summaries of the first two times he was exposed to the experimental situation are presented below.

SUMMARY OF CHILD B,
A BOY 51 MONTHS OLD AT THE BEGINNING OF THE EXPERIMENT

First Exposure, February 26, 1935.

4a As James was placed on the board he held to assistant, his knees bent and he kneeled on the board, and when asked to walk, said, "I can't. It's too high. I'll fall. I'll hurt myself," etc. He finally crawled across.

3b James held to assistant as he was placed on the board, then kneeled on the board. Finally, after protesting, "I'll fall," he walked across holding to experimenter's hand.

2c James held to assistant when placed on the board. He finally walked across alone at this height very cautiously and carefully, seeming not at all secure. He kneeled on the board, about a foot from the box, to take a toy.

3d As James watched board being moved up again he said, "Where are you putting it? Way up there?" When placed on board held to assistant with knees bent and said, "I can't, I'll fall. Hold my hand." Walked across holding to experimenter.

3e James asked the experimenter whether any other child had been to the experimental room and the experimenter told him that Harry had. Then James said, "What did he do?" Experimenter said that Harry walked the board at the very top of the ladder, and pointed to the rung at 6 feet. James, "Way up there? Way up there where those things are?" Jamee then asked to walk the board again. When placed on board, held to assistant, then walked 2 steps by himself. Then reached toward experimenter, said, "I'll fall, hold my hand." Walked across holding to experimenter.

Second Exposure, March 1, 1935.

4a As James approached the board he said, "I want to crawl." Experimenter explained, "The way to play this game James is to always walk across."

Then James said, "Will you hold my hand?" When lifted to board held to assistant, then walked holding to experimenter's hand. Kneeled on board after croesing to take toy.

3b James held to ladder when lifted to board. Then walked across by himself slowly and carefully, taking small, uncertain steps. Kneeled at end to take toy.

3c Same performance as above. When he reached end of board, experimenter asked him to remain standing when he took the toy. He replied, "No, I can't because I'll bump right into the box." This response was irrelevant and evasive because he was not near enough to the box to bump into it.

4d Board placed at 4 feet again. As James walked toward board he said over and over, "You'll have to hold my hand." James lifted to board and held to experimenter's hand. When experimenter attempted to remove her hand, he clutched the ladder, bent his knees, and sat on the board saying, "No, I can't. Hold my hand." When experimenter offered her hand again he stood up and walked across holding to her hand. Kneeled at end.

4e James said, "I want to crawl this time." "Hold my hand, then." Experimenter, "All right." Walked holding to experimenter but seemed much more at ease. Kneeled at end of board to take toy.

As James did not appear to be making much progress in these two exposures it was decided to take advantage of his interest in the performance of another child, as indicated by his questions concerning Harry. It seemed advisable here to determine what effect, if any, it would have on James' behavior to allow him to watch another child whom he knew and played with, perform without any signs of fear. The result of this attempt is summarized below.

Third Exposure, March 4, 1935.

4a Harry and James were brought together to experimental room. James was told he could have a turn first and he said, "That's too high for me." Then, "I can't, it's too high. Hold my hand." Then walked holding to experimenter. Harry then walked 4 foot board alone. James sat at table and watched. Board then placed at 6 feet. James said, "Harry, look where it is." Harry walked over to board quite unconcernedly, climbed up on chair, and let assistant place him on board. Experimenter asked James to watch Harry who walked across without hesitation.

4b Board placed at 4 feet again. Experimenter said, "Now, James, I want you to walk across all by yourself this time." James, "Will you walk beside me?" Experimenter, "Yes." James then walked the board without help, although experimenter walked along beside him. As he walked he bent over and walked very slowly and carefully, and kneeled at the end of the board when he took the toy. Experimenter praised this performance.

4c Harry had another turn on the board before James was asked to walk again. James then climbed from the chair to the board himself and stood up without help. As he started to walk he called, "Watch me Harry." Harry got up on the chair and watched. James walked across alone, bending over as before, but this time the experimenter did not walk beside him.

4d As Harry climbed onto the board for his turn, James tried to get onto the board first. He was asked to wait until Harry had finished. James then climbed up himself and walked alone, still bending over. Kneeled on board to get toy.

4e By this time there were no more toys in the box. James, however, with no suggestion from the experimenter asked if he could put back the toy he was playing with into the box. He evidently wanted this time to walk on the board. This time when experimenter asked him to stand up straight instead of leaning over, he did so and walked the remainder of the board with much more assurance.

Note: In 4d and 4e James is showing active interest and coöperation in the performance.

This record indicates that the addition of the example of a fearless child did have a definite effect on James' performance. This time, for the first time, he walked the board, placed at 4 feet without help. Two days later he was brought back to the experimental room alone to see if he would continue to show this progress. However, this was not the case. He refused to walk alone at 4 feet. He walked across twice at this height holding to the experimenter but the third time she stood away from the board so that he could not reach her. He then said, "I'm tired of this board. I don't want any more. It's too small. I'll fall." He sat on the board holding to the ladder and refused to stand up until the experimenter offered her hand. When the board was placed at 3 feet he walked across without help twice, although slowly and carefully and bending over as he walked.

When the nursery school teacher who had charge of the group of which he was a member was questioned about him, she stated that this type of behavior was quite typical. He frequently appeared to be making some progress in learning some nursery school procedure, such as dressing, washing, etc., and then the next day returned to his previous level, refusing, giving irrelevant excuses, etc. For James to relapse into "babyish" behavior when he came up against something which appeared difficult was not unusual.

For the fifth exposure, two other boys from the nursery school group were introduced. This time James was asked to perform first at 4 feet, to see if an audience of two of his friends would affect his behavior. However, he refused to walk alone. Then the board was moved to 6 feet and James watched as both children walked at this height. The board was again placed at 4 feet and again he refused. He then said, "I'll show you where

I want you to put it," and pointed to the ladder at 3 feet. When the board was placed there he stood on it and held to the ladder, then said, "I'll crawl." When urged to stand and walk alone he said, "I'm not going across, ever." He was then lifted from the board without being allowed to get a toy.

In the six following exposures, including one with Harry with whom he had formerly walked at 4 feet, one in which the experimenter did not aid him when he refused to walk at 3 feet but explained if he wanted a toy he would have to walk alone; and one where another child, with whom he had recently been playing, performed without fear, his behavior was essentially the same. In the eleventh and last exposure his behavior showed no progress beyond that of the first exposure.

Before the experimenter had completed eleven unsuccessful attempts to overcome this fear in this child, she felt definitely that she was trying to handle more than fear alone. The behavior that James showed in the experiment was, as already mentioned, quite typical of his behavior whenever he came up against anything difficult. His performance contrasted sharply with that of child A, in many aspects of the situation. Child A cooperated with the experimenter from the start, she seemed to enjoy the progress she was making and appeared to feel a definite sense of accomplishment when she succeeded in walking alone at a height before unattempted. James, on the other hand, continually asked for help and preferred to relapse into babyish behavior rather than make any attempt to cope with the situation. Although the experimenter tried to help and encourage him to participate actively and learn ways of handling the situation, such as learning to balance himself, take firm, sure steps, etc., James showed no inclination to make these attempts. He definitely seemed to prefer the other type of behavior.

This suggested that perhaps Blanchard's statement that fear sometimes continues for purposes of gaining satisfaction and that factors in the parent-child relationship often result in the prolonging or intensifying of emotional reactions, might be the case here.

The developmental and case history records of this child were examined to see if they might throw some light on this point. These records, kept by the nursery school, consisted of descriptive summaries of the child's progress in the nursery school; information blanks filled out by the parents consisting of family history, description of home environment and the child's early development; reports of home visits, etc. These records did yield information that appeared to be of significance.

The information provided by the parents in September, five months before the experiment was started, is of interest. His mother at that time described him as an only grandchild for four grandparents. She stated that he had been too much the center of attention. She also mentioned that he was afraid of heights, big slides, etc., that he needed motor and muscular development more than anything else, and that he "seemed absolutely unimpressed by examples of other children doing better than he at athletics." His early physical development had been retarded because of illness. He never sat up alone, or walked with help. When he recovered from his illness he walked alone at 14 months. He also had feeding difficulties with constantly changing formulas during his first year, and is sensitive to starches. It is therefore likely that his early illnesses caused his parents and relatives to adopt an over-protective attitude toward him and to encourage inadvertently the "babyish" behavior that is still apparent. At the same time there is evidence to indicate that they sometimes expected too much of him.

It is of particular significance here that during the period, from

February through May, that the experimenter was attempting to overcome his fear of heights, he was being deprived of some of this attention at home. First, just before the fourth exposure, when he lost the progress he appeared to make in the preceding exposure with Harry, his nurse, who had been with the family for a year and a half and on whom he was very dependent, left the family. He announced this to the experimenter at the time saying, "I have a new nurse. Jan's got another job." Then his mother was pregnant and went to the hospital the end of April. She was away from home for several weeks, returning home with the new baby. Therefore it is very likely that during this period, James was no longer the center of attention at home. He was being required at home to make new adjustments at the time when the experiments were being conducted. It is possible that being required to make two such simultaneous adjustments in his behavior was too much for him.

The fact that his mother reported that he was afraid of heights and that he seemed unimpressed by examples of other children suggests that some stresses may have been placed on this at home. It appears that the treatment he received at home was not consistent. Sometimes he was expected to do things beyond his ability and at other times he was allowed to get what he wanted, by whining, crying and relapsing into behavior below the level of that of a child of his age. His fear of heights may, in this way, have become a means of gaining satisfaction. Therefore the very fact that the experimenter made him the center of attention during the experiments may have been the reason why he made no attempt to learn to cope with the situation, but appeared to prefer to ask for help, etc.

In other words, the experimenter was not dealing only with James' fear of heights but with his whole behavior pattern. In attempting to overcome his fear of heights she was attempting to change a type of reaction which he showed consistently in many other situations that were not fear inspiring, but which required him to make persistent efforts at mastering.

This is probably a point of great importance in dealing with any fear, for fear is not a specific entity but is tied up with the child's total personality. If there are factors in the child's home environment and in the parent-child relationship which tend to prolong or encourage certain types of fear behavior, then these must be changed first before much success in overcoming the specific fear can be expected.

That factors within the child himself supply a potent element in the process of overcoming fear has already been mentioned. Further evidence of this appeared in the experiments. Eight of the children had been among the subjects of experiments the preceding year. Three of these had shown fear of the high boards at that time. One of these was the child Jean, whose fear was overcome during the present experiment. The remaining two children showed no fear when exposed to the same situation this year. No particular attempt was made to overcome fear in these two children. The factors within the child himself of general maturation and growth plus increased experience were undoubtedly operating here. It is also of interest that both these children appeared to be aware of their progress, although the experimenter said nothing to suggest this. One child, a girl of forty-seven months, said as she was standing on the 4 foot board, "I'm not afraid now. I was last year." The other child, a girl of the same age, when she walked the boards placed at 4, 5 and 6 feet, said at the completion of each performance, "There, good!"

This suggests that these children were pleased with and aware of their increased ability to accomplish a feat that was formerly fear inspiring. It is this element, the child's own desire to overcome the fear, which is sometimes apparent (this is strikingly apparent in the Dark Room experiment reported previously) which aids greatly any attempt to eliminate fear. When it is entirely absent, as appeared to be the case with James, the problem of overcoming the fear is made much more difficult.

CONCLUSION

This investigation attempted to discover the adequacy of a method of overcoming fear of a high place and a dark room under experimental conditions. The method was essentially that of directing and aiding the child in learning various ways of coping with the fear situation. It required the child to be an active participant in the procedure. The procedure also included verbal reassurance, gradual familiarization with the fear situation, and a pleasant conclusion to each performance in the form of a game.

The subjects were twenty children attending a private nursery school. Their ages ranged from thirty-nine to fifty-four months. These children were exposed to two experimental fear situations, namely; a board that could be raised from two to six feet from the ground, and a dark room, to discover any existing fears.

Of these children, only two showed definite fear of the high board, all the others walked across at six feet from the ground. There were fourteen children who showed fear of the dark room in that they refused to enter unless accompanied by the experimenter.

The method which was used in attempting to overcome fear of the high board consisted in aiding and encouraging the child to acquire the abilities which would enable him to participate in the situation. This was successful with one of the children who had formerly been afraid, but it was unsuccessful with the other child. The child whose fear was overcome finally walked across the board when raised to six feet, with complete confidence and ease, not only in the experimental room, but also when it was moved to the nursery school playground. The other child made no progress at all in overcoming his fear, even when the method described was combined with allowing the child to observe the example of several other completely fearless children. Information concerning the general behavior and personality of this child suggested that factors in the home environment and in the parent-child relationship were operating in a way which tended to prolong or encourage this type of fear behavior.

The method was successful in overcoming the fears of thirteen of the fourteen children who were afraid of the dark room. The experiment was not completed with one child. The procedure used here helped the child to learn ways of orienting himself and finding his way through the dark, in order to turn a light on at the back of the room. In the case of one child, another method, that of the example of a fearless child, was used.

The conclusions to be drawn from these results are limited by the fact that no evidence was available to indicate whether the fears of height and dark which were overcome, were eliminated only with reference to the experimental fear situation or whether those fears would also be eliminated in other situations in which they might be encountered.

The behavior of the children while they were being exposed to the procedure indicated that factors within the child himself supply a potent element in the progress of overcoming fear.

REFERENCES

- (1) Anderson, J.E.: Happy childhood. New York, Appleton-Century, 1933, pp. 73.
- (2) Arlitt, A.H.: The child from one to three. New York, McGraw-Hill, 1931.
- (3) Arlitt, A.H.: Psychology of infancy and early childhood. 2nd. ed. New York, McGraw-Hill, 1930, pp. 126.
- (4) Blanchard, P.: The training of the psychiatrist. V. Training of the psychiatrist in psychology. Am.J.Orthopsychiat. 1931, 1, 380-385.
- (5) Blatz, W.E. and Bott, H.: Parents and the preschool child. New York, Wm. Morrow and Co., 1929.
- (6) Faegre, M.L. and Anderson, J.E.: Child care and training. 2nd ed. Univ. of Minnesota Press, Minneapolis, 1929.
- (7) Gesell, A.: The guidance of mental growth in infant and child. New York, Macmillan Co., 1930.
- (8) Gruenberg, S.M.: Your child today and tomorrow. 3rd ed. Philadelphia, J.B. Lippincott, 1928.
- (9) Jersild, A.T. and Holmes, F.B.: Methods of overcoming children's fears. J. Psychol. 1936, 1, 75-104.
- (10) Jersild, A.T.: The utility and prevention of fear. Parts 2, 3, and 4 of Children's fears by Jersild, A.T. and Holmes, F.B., Bureau of Publications, Teachers College, Columbia University, Child Development Monograph No. 20, 1935.
- (11) Jones, M.C.: A laboratory study of fear. The case of Peter. Ped. Sem. 1924, 31, 308-315.
- (12) Jones, M.C.: Elimination of children's fears. J. Exper. Psychol. 1924, 7, 382-390.
- (13) Klein, M.: The psychoanalysis of children. New York, W.W. Norton and Co., 1932, pp. 57.
- (14) Langdon, Grace: Home guidance for young children. New York, John Day Co., 1927.
- (15) Thom, D.A.: Everyday problems of the everyday child. New York, Appleton Co., 1927.
- (16) Watson, J.B.: Behaviorism. New York, W.W. Norton and Co., 1924, 25, pp. 136.
- (17) Watson, J.B.: Psychological care of infant and child. New York, W.W. Norton and Co., 1928, pp. 286.

EXPERIMENTS IN THE MEASUREMENT OF ATTITUDES TOWARD CHILDREN:
1899-1935

RALPH M. STODDILL

One of the most impressive features of contemporary literature on mental hygiene and child guidance is the frequent and emphatic reference to unwholesome parental attitudes as primary factors in the causation of behavior maladjustments in children. Attempts to measure these attitudes objectively, however, are of comparatively recent origin. Yet a survey of the literature yields almost two hundred titles reporting experiments in the measurement of parent-child relationships and the effects of parental attitudes upon the child. These are in addition to Thurston's (25) comprehensive bibliography of some 270 pages covering particularly the mental hygiene aspects of parent-child relationships.

The present paper is concerned only with those investigations in which some test or questionnaire has been employed for recording and scoring the attitudes of adults toward children. This procedure unfortunately eliminates from consideration such valuable contributions as the Smith College Studies in which case history data are analyzed to determine parental attitudes.

The brief abstracts which follow give some idea of the measuring technique used in each research, and the results obtained.

THE EXPERIMENTS

As early as 1899 Sears (16) employed the questionnaire technique in a study of adult attitudes toward the punishment of children. The answers of 486 adults indicate that the majority believe the chief purposes of punishment are to prevent wrong doing and to reform the offender. Punishable acts are any offenses committed intentionally, persistently or by repeated carelessness. This applies especially to such offenses as wilful disobedience, disorder, running away and quarreling. Offenses not regarded as punishable are slight or unintentional mistakes, and offenses committed through ignorance, weakness or fright. Almost a third of these adults believe that a child should be punished, even though the child's fault was caused by the parents' or teachers' conduct.

The first really systematic attempt to measure the attitudes of parents toward children was that of Laws (10) published in 1927. The administration of a questionnaire to a study group of fifty mothers indicates that mothers tend to rate themselves in their relations to their children and their practices concerning them somewhat lower (that is, less constant, less gentle, less abrupt, less impatient, etc.) than observers rate them. However, these mothers tend to rate the behavior of their children somewhat higher than observers rate them. These results suggest "that children appear to their parents in a somewhat better light than they do to their neighbors and friends except where the responses are too great a source of irritation and annoyance to the parent or where children are likely to make a better showing to persons outside the family".

Wickman (26) made an extensive analysis of teachers' reports of behavior problems observed in school children. Violations of school and classroom rules were frequently observed, while personality difficulties were rarely mentioned. Fifty representative items of children's school behavior were employed in the construction of an attitude questionnaire which was administered to 511 teachers and 30 mental hygienists. Each item was rated on a linear scale as to the degree of seriousness with which it was regarded. Wickman's results indicate that teachers regard immoralities, transgressions against authority and violations of classroom routine as more serious than maladjusted personality and behavior traits. Mental hygienists, on the contrary, regard withdrawing, recessive personality traits as more serious than aggressive behavior traits, or violations against authority or school routine.

Using Wickman's questionnaire, Bain (2) compared three groups of graduate

students tested in 1932 at Teachers College, Columbia University, with three similar classes tested there by Wickman in 1927. The results of the students correlated more highly with those of the mental hygienists at the beginning of the semester than do those of the 1927 students at the end of the semester of study, but do not show much improvement at the end of the semester. The items which were rated significantly more serious in 1932 than in 1927 have to do with recessive, withdrawing behavior; while those which were rated significantly less serious in 1932 are concerned with aggressive behavior and moral questions.

Yourman (28) and Snyder (17) have also verified Wickman's findings regarding the conservatism of teachers' attitudes toward children.

MacClenathon (12) had teachers and parents rate a list of 50 child misbehavior traits as to frequency of occurrence and degree of seriousness. Each group (teachers and parents) "tended to rank as most serious those behavior patterns interfering most with the smooth functioning of that group's affairs".

Stodgill (18), using an adaptation of Wickman's attitude schedule, made a comparative study of the attitudes of parents and mental hygienists. Seventy items of child behavior were rated on a 1 to 10 scale, according to whether they were considered to be of no consequence, of little consequence, undesirable, serious, or very serious. It was found that parents regard transgressions against morality and opposition to parental control as more undesirable than disrupting the quiet and routine of the household and breaches of family etiquette. These in turn are regarded as more undesirable than self-centered, withdrawing types of behavior. Mental hygienists, however, regarded extreme withdrawing behavior and unsocial behavior as more serious than transgressions against morality, breaches of family etiquette, and disrupting the quiet and routine of the household. These in turn are regarded as more serious than opposition to parental control.

In a subsequent study (19), comparing the above mentioned parents and psychologists with a group of college students in a course in mental hygiene, the following rank order correlations (computed from the rank order arrangement of the seventy items as rated by the three groups) were obtained: Mental hygienists with parents .45; mental hygienists with students .58; parents with students .94. Students tend to be more liberal in their rating of behavior than parents are, but not significantly so.

In an investigation conducted in 1930, Stodgill (23) obtained responses to a list of 50 questions regarding the age at which children might be allowed to assume responsibilities. As compared with psychologists, parents are extremely reluctant to grant children (even when the children reach adulthood) responsibilities in social contacts, in love affairs, and in freedom from parental curiosity and dominance.

Ojemann (13) has improved the technique, last mentioned using separate scales for the measurement of attitudes toward pre-school, elementary, and high school pupils. He finds that "parents tend to be reluctant in allowing responsibilities to pass from parent to child. The data also give some indication that this reluctance tends to continue throughout life unless some special effort is made to modify it". The results of fifteen individuals highly trained in child development indicate that these judges are in favor of allowing children considerable more responsibility than parents deem advisable.

Koch (9) employed the Thurstone technique in the construction of two scales for the measurement of attitudes toward children's freedom. The attitudes of the less educated subjects were more inconsistent and variable than for the more educated groups. In the case of both men and women, the greater the amount of academic education, the more liberal the opinion expressed. Statistically significant differences were found between the scores of 71 subjects known to be stern,

in their attitudes and 40 subjects known to be lenient. Men are slightly less lenient than women. Parents are more stern than children, and teachers are more lenient than either parents or children.

Scales for the measurement of attitudes toward the parental control of children and toward the social adjustments of children have been developed by Stogdill (21, 22, 24). Significant differences were found between the reactions of parents, students and psychologists on these scales. Psychologists endorse freedom for children and approve of extraverted social adjustments. Parents are ambivalent in their attitudes toward children's freedom, as revealed by their responses to individual items. However, when total scores are considered, they are found to endorse strong control. Parents of delinquent children endorse very strong control. Parents also approve of introverted, withdrawing social adjustments in children. College students occupy a neutral position on these scales. Enlightened attitudes toward children are associated with high socio-economic status, special education in social or psychological sciences, favorable home training, and residence in the East or Middle-west; but not with sex, marital status or intelligence.

Fifteen traits to be stressed in rearing children were rated by 37 business-class mothers and by 104 working-class mothers in the Lynd and Lynd (11) study of a typical American city. These same mothers also made estimates as to how their own mothers would probably have rated these traits. "Loyalty to the church" was rated first in importance by the working-class mothers, and for their own mothers. This was rated fourth by the business-class women; but as second in importance for their own mothers. "Strict obedience" was rated as second in importance by all groups except the mothers of the business-class women, for whom it was rated as first. Business-class mothers placed the greatest importance on "Independence", and only slightly lesser importance on "Frankness in dealing with others". Working-class mothers, however, were more concerned with "Good manners", "Economy in money matters", "Getting good grades in school" and "Desire to make a name in the world". Although "Knowledge of sex hygiene" is rated as of minor importance by both groups of mothers, still they regard it as of considerably greater significance than it was regarded by their own mothers.

Stogdill (20) using a scale for the measurement of attitudes toward various forms of parental behavior found that psychologists "regard as relatively more harmful those forms of activity on the part of parents that cause the child to lose confidence in human beings and to feel a lack of security in his environment. Parents, on the other hand, regard as relatively more harmful those forms of parental activity which allow the child a certain degree of aggressiveness, independence and freedom from moral repression".

Jack (8) used a prepared interview form on which to record mothers' answers to questions about the behavior of the child and the practices of the parent. No significant differences were found in the interview scores made at the beginning and at the end of a four months period of parent training.

Ackerley (1) secured responses from 771 parents of elementary school children to information tests and attitude questionnaires on questions of emotional development, mental development, physical growth, sex education, social development, use of money, and vocational guidance. Very few significant differences were found between the responses of fathers and mothers to the test items. "All attitude tests used in this study revealed parental opinions that were outside the range which the experts considered an intelligent attitude."

Attitude scales and knowledge and practice questionnaires were administered by Hedrick (7) to four groups of mothers at the beginning and again at the end of a six weeks training series. Analysis of the initial and final measurements indicates that these mothers made significant gains in attitude, information and practice regarding self-reliance in children in such matters as eating, sleeping,

toileting, and use of money.

Butler (3) constructed scales "for the measurement of pupil attitudes toward the family as an agency for personality development, toward the father's part in the care and upbringing of children, and toward the value of play in the child's development". Responses were obtained from 1586 high school pupils (927 girls and 659 boys). The results indicated that the responses of these students were highly inconsistent, and "that many of their opinions were beyond the range within which competent judges recognize intelligent or mature attitudes". Significant changes in attitude toward self-reliance were brought about by a course of training on this subject.

Witmer (27) studied the attitudes and practices of 600 mothers toward sex education of children. Each mother was given two questionnaires: (a) an Attitude Questionnaire on which to indicate her attitudes toward sex education of children, and (b) a Behavior Questionnaire on which to indicate the extent of the sex education of her children and the source from which such information was received. In addition, each mother was interviewed, and an estimate was made by the interviewer (a) as to the mother's attitudes toward sex education, and (b) as to her practices regarding the sex education of her own children. The correlation between the mothers' attitude scores and the estimate of their attitudes made by trained interviewers was 0.84. When mothers' attitude scores were correlated with their behavior scores the correlation coefficients ranged from 0.30 to 0.53. It was found that differences in opinions cannot be accounted for on the basis of age, religion, nationality, or community in which these mothers were reared. Education, husbands' occupations, types of houses in which they live, all socioeconomic indexes, do account to some degree for differences in opinions.

By means of a questionnaire, Rice (15) found that of 83 college men and 130 college women students, 63 men and 113 women confessed to having daydreams of marriage, while 61 men and 99 women reported having daydreams of children. Of those expressing a desire for children, 52.6% of the men and 45.2% of the women wanted three children or less. On the basis of comments made, the author concludes that the results "indicate a general, intelligent, and wholesome anticipatory interest in their prospective families on the part of the subjects".

Hall and Mohr (6) report an interview study of 66 expectant mothers awaiting the births of their first children. Although pregnancy had not been planned in two-thirds of these cases, all but one-sixth of the expectant mothers were reconciled to the condition. Financial and marital worries, and superstitious fears concerning heredity and marking were mentioned most frequently as causes of feelings of uncertainty regarding their pregnancies and the welfare of their expected children.

A rating scale was developed by Fitz-Simons (4) for the purpose of classifying clinical case records according to the parent's emotional attitude towards his child. In 94 cases studied intensively, analysis of the behavior problems of the children and the attitudes of the parents reveals that the largest number of aggressive behavior reactions (such as disobedience and lying) per child occur in cases where the child is rejected by one or both parents. The largest number of withdrawing reactions (such as daydreaming and shyness) occur in those cases where the mother is over-protective and the father negative.

Among the tests developed by Peters (14) for "measuring the mores" is a set of scales for measuring attitudes toward children. The groups studied include college faculty members, college students, socially elite girls, and coal miners. The groups indicating their attitudes also reported their practices in regard to each item. The mores approved by the groups are, in general, more admirable than the practices reported as occurring in the groups. When these groups registered their approval or disapproval of 500 parent-child scenes in 142 feature films, it was found that the "movies practice restraint from 'bad' parent-child scenes

to a much larger degree than the people of our several social groups practice restraints from corresponding acts....This means that, in respect to the treatment of children by parents, the movies are distinctly better than life."

SUMMARY

1. Parents are highly conservative in their attitudes toward children. (1, 9, 12, 13, 18, 22). Teachers also are very conservatives. (2, 12, 17, 26, 28). These two groups approve of child behavior which makes for smooth running of the household and classroom, but they show little regard for the wholesome personality development of the child.

2. Clinical psychologists approve of an active, extrovert, social adjustment in a child, regardless of the inconveniences to parents or teachers. They regard as undesirable the withdrawing, self-centered reactions of which parents and teachers approve. (2, 18, 22, 26).

3. Parents endorse strict control, while psychologists stress freedom from compulsion. (9, 13, 16, 22).

4. Parents are inconsistent, or ambivalent in certain of their attitudes toward children. (10, 22).

5. Children are somewhat more liberal in their attitudes toward children than parents are (9, 11, 14, 19, 22) and women are slightly more liberal than men. (9, 22).

6. The results of certain of these studies suggest that unwholesome parental attitudes are associated with religious, social and economic conservatism (14, 22), and with educational and socio-economic deprivation. (9, 11, 14, 22, 27).

REFERENCES

- (1) Ackersley, Loie A.: The information and attitudes regarding child development possessed by parents of elementary school children, Univ. Iowa Stud. Child Welfare, 1935, 10, 113-167.
- (2) Bain, Winifred E.: A study of the attitudes of teachers toward behavior problems. Child Development, 1934, 5, 19-35.
- (3) Butler, Evelyn I.: A study of the needs of high school students and the effectiveness of a program of learning in selected phases of child development and family relationships, Univ. Iowa Studies, Child Welfare, 1935, 10, 169-248.
- (4) Fitz-Simons, M. J.: Some parent-child relationships as shown in clinical case studies, Jour. Exper. Educ. 1933, 2, 170-196.
- (5) Fitz-Simons, M. J.: Some Parent-child relationships. New York, Columbia Univ. Contrib. to Educ., No. 643. 1935.
- (6) Hall, Dorothy E. and Mohr, George J.: Prenatal attitudes of primiparae; A contribution to the mental hygiene of pregnancy. Mental Hygiene, 1933, 17, 226-234.
- (7) Hedrick, Blanche E.: The effectiveness of a program of learning designed to change parental attitudes toward self-reliance. Univ. Iowa Stud. Child Welfare, 1935, 10, 249-268.
- (8) Jack, Lois M.: A device for the measurement of parent attitudes and practices. Univ. Iowa Studies Child Welfare, 1932, 6, 135-149.
- (9) Koch, H. L., Dentler, M., Dysart, B., and Streit, H.: A scale for measuring attitude toward the question of children's freedom. Child Development, 1934, 5, 253-266.
- (10) Laws, Gertrude: Parent-child relationships - a study of the attitudes and practices of parents concerning social adjustment of children. New York Columbia University, Contrib. to Educ., No. 283, 1927.

- (11) Lynd, R. S. and Lynd, H. M.: Middletown: a study in contemporary American Culture. New York, Harcourt, Brace and Co., 1929.
- (12) MacClenathon, R. H.: Teachers and parents study children's behaviors, Educ. Social., 1934, 5, 325-333.
- (13) Ojemann, Ralph H.: The measurement of attitude toward self-reliance. Univ. Iowa Stud. Child Welfare, 1935, 10, 101-111.
- (14) Peters, Charles C.: Motion pictures and standards of morality. New York, Macmillan, 1933.
- (15) Rice, Stuart A.: Undergraduate attitudes toward marriage and children. Mental Hygiene, 1929, 13, 788-793.
- (16) Sears, C. H.: Home and school punishments. Ped. Sem., 1899, 6, 159-187.
- (17) Snyder, L. M.: The problem child in the Jersey City Elementary Schools, J. Educ. Sociol., 1934, 7, 343-352.
- (18) Stogdill, Ralph M.: Parental attitudes and mental hygiene standards, Mental Hygiene, 1931, 15, 813-827.
- (19) Stogdill, Ralph M.: Attitudes of parents, students, and mental hygienists toward children's behavior, Jour. Social Psychol., 1933, 4, 486-489.
- (20) Stogdill, Ralph M.: Attitudes of parents toward parental behavior, Abnorm. and Soc. Psychol., 1934, 29, 293-297.
- (21) Stogdill, Ralph M.: The measurement of attitudes toward children. Ph.D. Dissertation, Ohio State University Library, 1934.
- (22) Stogdill, Ralph M.: The measurement of attitudes toward children. Abstract of Doctor's dissertation, Ohio State University, 1935, 16, 189-201.
- (23) Stogdill, Ralph M.: At what age should children be allowed to grow up? (To appear in Parents Magazine)
- (24) Stogdill, Ralph M.: The measurement of attitudes toward parental control and the social adjustments of children. (To appear in J. Appl. Psychol.)
- (25) Thurston, Flora M.: A bibliography on family relationships. New York, The National Council of Parent Education, 1932.
- (26) Wickman, E. K.: Children's behavior and teachers' attitudes. New York, The Commonwealth Fund, 1928.
- (27) Witmer, Helen Leland: The attitudes of mothers towards sex education. Minneapolis, Univ. of Minnesota Press, 1929.
- (28) Yourman, J.: Children identified by their teachers as problems, Educ. Sociol., 1932, 6, 334-343.

AN EXPERIMENT IN THE STUDY OF INDIVIDUAL DEVELOPMENT¹

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In the last fifteen years child development centers have accumulated many records on individual children, chiefly for the purpose of making cross-sectional studies. Such studies do not, admittedly, tell us how the individual develops, or take into consideration the total functioning organism or the integrated personality. If such a study of the "whole child" is to be made, it is evident that we must cast aside the group data formulae, investigate techniques suitable for dealing with data on the individual child, and perhaps develop new techniques of dealing with the qualitative data which must be considered along with the quantitative material.

We have recently experimented with such a study at the Merrill-Palmer School, and should like to present some suggestions which have emerged from it. Since the report of the study is available only in manuscript, an abstract of its contents is given.

This experimental analysis of all the data recorded by the Merrill-Palmer School on a single child, from the time she was 20 months of age till she was 8-1/2 years old was made: (1) primarily, to explore the techniques and values to the field of child development of elaborate studies of individual children; (2) secondarily, to show the adequacies and deficiencies of the Merrill-Palmer records of child development, with a view to future planning.

The material is classified under: An Introduction, describing the methods used in the study of the physical and psychological, eugenic and eutheic data, including the graphical and biographical methods, the chronological chart, and a chart showing relationships in the data, with suggestions to investigators. A chapter on Infancy (11 pp.) with data reported by the mother, and a description of the family and its history. A chapter on the Preschool Period (161 pp.), with an analysis and summary of physical growth and habits and mental growth and personality development, based on records taken during attendance at nursery school. A chapter on the Preadolescent Period (112 pp.), including a similar analysis and summary. A section on Conclusions (5 pp.), both as to methods of synthesizing data on the individual and the adequacy of the records, as revealed by the study, and as to child training and the study of child development; e.g., the study demonstrated a need for child development centers to broaden the age range of the children studied beyond the preschool period, and to make long-time studies showing which phenomena in one epoch of life may be significant for a subsequent epoch. An Appendix (30 pp.), appraising the child development records of the Merrill-Palmer School in the light of this study.

¹ Adapted from a paper read before the Society for Research in Child Development, Chicago, November 10, 1935.

² From the Merrill-Palmer School, Detroit.

It may be suggested that in thus forsaking the group and turning to a study of the growing, functioning, individual child, we are retrogressing rather than progressing in our science. Does not science deal with the general law, not the specific instance? Did not students of personality frankly turn from the qualitative case study to the quantitative group study, because the former produced no useful generalizations? The reply to this question is not clear, nor does out study answer it.

However, our study does show how many data on an individual child may be combined to show both static pictures at different periods and development through time. It suggests techniques for considering qualitative and quantitative data jointly, and for indicating possible interrelationships in data from different fields. It shows the adequacies and deficiencies of various records for such a study; makes it apparent that records made for the purpose of cross-sectional studies do not necessarily meet the needs of a study focused on the individual child; and shows that if such studies are to be made, a new concept of record-keeping must be developed. It shows also how expensive such studies are when there is a wealth of material to be dealt with, and, if they are to be undertaken, suggests the desirability of combining the energies and resources of several centers, in order that methods may be explored further with a larger number of cases, thus increasing the possibility of discovering the generalizations applicable to individual growth and development.

The child whose records were studied was not one of the oldest of those who had attended the nursery school, but was selected because a new series of personality ratings, which it was thought desirable to study in this connection, had been introduced during her attendance at nursery school. She attended the nursery school the maximum length of time (from 20 months to 5 years of age), and had also continued in touch with the school through attendance at its recreational clubs for graduates of the nursery school, the Merrill-Palmer Camp, and an experimental church school class conducted by staff members. Records of all these groups were available. Records of infancy, now taken on many of the children, were lacking.

Techniques experimented with in the study were: (1) A manuscript, in which the qualitative data are reported completely, and considered with (2) graphs, showing time series of quantitative data, made comparable by adoption of the same time base; (3) charts, including a Life Chart, classified by trait groups, showing ages when certain tendencies first appeared, events in the life of the child, and relevant explanatory data, and Constellation Charts, showing diagrammatically certain assumed interrelationships of the data.

The manuscript, despite its great detail, gives interesting and convincing evidence of the interdependence of traits, both physical and mental, and offers some basis for believing that it will eventually be possible to study the sequential development of traits and the underlying factors influencing the development.

The graphs were of three kinds, that is, those illustrating raw data and such standards as percentiles, those plotted on semilogarithmic paper to show changes in rate of growth, and prediction curves drawn up according to the Courtis formula. Considering the graphs as to their adequacy and interrelationships: The physical measurements, under which heading most of the quantitative data fell, were more satisfactory than were the psychological, for they had been taken more regularly, more frequently, and over a longer period of time. A study of the curves revealed no conspicuous relationships, with the possible exception of skeletal age and certain other physical factors. From a study of the graphs as a whole it appears that in studying the interrelationships of various data, such as sleeping, feeding, emotional disturbances, etc., more progress may be made by measuring fewer children more frequently than a greater number at longer intervals.

The Life Chart, which records the outstanding facts of the manuscript, is a set of four large sheets on which have been printed, chronologically by months of age and in separate columns according to the sort of material under consideration, the events of the child's life and various aspects of her development. It shows, for example, periods of emotional adjustment and maladjustment and the concomitant conditions, and periods of rapid and slow growth. Even thus simplified, the chart is complicated by detail and requires close study. It is successful in showing the early origin and persistence of most personality characteristics, as well as the scanty records in certain areas.

The Constellation Charts represent the least scientific of the methods used. They show interrelationships which may be inferred from the data, are simple to inspect, and strike the imagination with their implications. It is doubtful whether they could be developed into a satisfactory technique unless many cases with comparable material could be studied. Each of the charts has a central core or trait, and by a diagrammatic device the influences in the child's life which may have contributed to the central trait and the results which followed from this trait are shown. Such a chart also shows graphically that effects become causes and reinforce the central trait.

In conclusion, the study suggests the need of a somewhat different type of record-keeping for studies of the individual child than for cross-sectional studies. Records for the study of the individual child demand more frequent observations and measurements, more carefully selected ratings of the standardized type, and more adequate observations of the anecdotal type, taken for the purpose of disclosing trends. There is also a need in such a study for more intimate home records and more reports of how specific situations were handled by the adult.

In general, in this study, gaps in records can be attributed to the fact that data were gathered over a period of years without a plan for study of individual development. It is apparent that if such studies are to be undertaken, records must be planned which will disclose all aspects of growth and can be so studied as to reveal interrelations in these aspects of growth.

THE DEVELOPMENT OF THE PRIMARY DRIVES IN INFANCY

KATHARINE M. BANHAM BRIDGES¹

INTRODUCTION

In the following paper, the writer attempts to put forth a point of view regarding the primary drives or instincts and their ontogenesis during infancy. It is based upon the results of close observation of infant behaviour considered in the light of various current theories presented in the literature. A list of some of the works from which material or suggestions have been drawn is appended at the end of the article. It would be impossible to give a complete set of references both for economy of space and because of the difficulty of tracing the number of casual inferences and indirect sources of information which go to form a composite viewpoint. The writer acknowledges appreciatively, however, all such contributions.

The expression "primary drives" is here used to refer to those mental processes which are ordinarily termed "instincts" or "instinctive tendencies" in the older text-books of psychology. They are response potentialities which are common to the human race and which gradually manifest themselves in the course of individual development. It was previously thought that these behaviour tendencies were inherited. In fact the term "instinct" was often defined as an inherited tendency to behave in a certain general way under specified general conditions. The word was indifferently used to denote either the predisposition to act or the behaviour pattern in which this potential urge manifested itself.

Recent studies of child and animal life have shown how even so-called instinctive behaviour undergoes processes of development and change of form in response to environmental conditions. Birds, for example, have been kept north during the migration season by giving them artificial sun-ray treatment. Thus, the instincts are no longer considered to be inherited as fully matured reaction patterns; they are acquired adaptive responses.

Although many psychologists have come to regard instincts as universal habits rather than innate patterns of response, yet they postulate certain inheritable "urges" or "drives" which determine the formation of these general habits. The writer wishes to suggest, on the basis of infant behaviour studies, that the "drives" themselves are ontogenetically developed.

Thus, the term "primary drive" is adopted to substitute that of "instinct" in this article, in order to avoid the implication of inheritance either of behaviour pattern or tendency. But since instinctive behaviour undergoes a process of orderly development and maturation regardless of wide variations in conditions, the possibility of inherited predispositions to respond is not entirely dismissed. Further study of foetal life, however, may reveal the fact that apparently inherited, general behaviour tendencies are pre-natal acquisitions.

In previous publications, the writer has endeavoured to show how in the course of individual development emotional behaviour seems to resolve itself into definite patterns, by processes of differentiation, integration, and specialization. Instinctive drives were seen to play an important rôle in this patterning. Continued studies of infant behaviour reveal further that these instinctive drives themselves are adaptive responses to common conditions in the environment. They also go through a defining process of individuation and organization, and they appear in characteristic forms at successive age-levels during early childhood.

In emotional behaviour the individual undergoes processes of self-modification and internal adjustment in response to overwhelming external conditions; whereas

in instinctive behaviour the adapting organism makes attempts to modify the environment to accord with internal conditions.

The "primary drives" are response tendencies acquired in relation to common qualities of ordinary recurring situations. They manifest themselves in general patterns of behaviour, which include such specific skills as biting, hitting, pulling or running. And they follow the same laws of growth, maturation, and individuation as do these specialized activities. The ordinary names of the different instincts refer variously to the type of provoking situation, the nature of the behaviour, or the inferred probable goal of activity. For instance, the hunger instinct takes its name from the stimulating circumstance of gastric muscular contraction, pugnacity refers to aggressive behaviour, while escape is the goal of another instinctive response. Possibly the use of the term "drive" instead of "instinct" in psychology might result in a more systematic naming of these action tendencies, according to the form of the behaviour trend rather than the provocative cause or the end result.

The objectives of instinctive behaviour, for instance personal security or retaliation, provide powerful motives both for intellectual and motor activity. But these goals are not necessarily predetermined. They are rather the effective end-results of previous neuro-muscular activity. Protection of the young, for example, is not a determining cause of maternal behaviour, but rather an end observable from outside. The individual may or may not be fully conscious of the goal or purpose of his instinctive behaviour. He is aware usually of an indefinite "urge" accompanying his behaviour "set" or actual activity in response to certain frequently recurring common attributes of environmental conditions.

Any acquired habit is a "drive" to some extent, a potentiality to act in a certain way under appropriate stimulation. The distinguishing features of the habits grouped as "instincts" are their universality, their primacy in ontogenetic development, and their potency as drives. This potency is determined by continued internal stimulation from organic activity, by the repeated occurrence of common factors in all environmental conditions, by the totality of the organismic response, by the satisfying adequacy of the resulting effect of previous similar behaviour, and by the early establishment of these general behaviour trends in childhood.

The general conditions, or qualifying attributes, of the environment which arouse these primary drives can be found upon analytical examination of the total situation to which the individual is responding, including both internal bodily and external conditions. Super-ordinate concept names may then be selected to designate these general types of situation. In a similar way, the final goal of instinctive behaviour is an inferred generalization based on the comparative study of numerous specific reactions. The same processes of abstract analysis and generalization applied to the behaviour itself reveal the common features, the conceptual names for which distinguish the different drives.

OBSERVATIONAL DATA

In order to obtain first-hand information with regard to the nature and development of the primary drives, these dominating forces in human behaviour, a series of minute observations were carried out by the writer in two founding hospitals in Montreal. In one institution twenty-four infants between the ages of two weeks and twelve months were observed one morning a week for four months. In the other hospital, forty-eight babies between two and eighteen months of age were observed three hours a week at different times of the day, for a period of six months. In this case, there were three children of each monthly age-level under observation.

There were an equal number of boys and girls in each of the two groups. The

babies were all in good health, and they were drawn from eleven different national origins. More than half of the mothers were English-speaking Canadians and the others were chiefly of Jewish nationality, originally from Poland or Russia.

A further series of weekly observations were made on two groups of older children in one of these institutions during a period of three months. One was a group of twenty-five girls between three and six years of age, and the other of thirty boys between four and six years, all in good health. The observational records collected during previous studies of the social and emotional behaviour of infants and pre-school children were also consulted for evidence of the growth of primary drives.

In analyzing the observational data, temporal factors as well as spatial factors in the situations were taken into account. For instance, the length of time since feeding, since sleeping or since the child's posture had been changed, were considered as important as the mere fact of the arrival of food or a strange visitor. The nature of the child's behaviour was studied in relation to the many aspects of the provocative situations and to the achieved ends. Generalizations were then made with regard to situational qualities, frequent behaviour responses, and apparent objectives.

The main criteria accepted for the "primary drives" were: (1) primary in order of genetic appearance of the behaviour pattern; (2) invariability of general type of response upon recurrence of the situation; (3) frequency of occurrence, and duration of the behaviour; (4) universality of the response in all groups of children studied; (5) continuance of the behaviour throughout the age-range observed; (6) and to some extent the dominance of the drive in the presence of counter stimulation.

Since in this study the writer was only concerned with general behaviour trends, actual numbers of specific responses like arm-extension or head-turning were not counted. Only round figures in time and frequency were compared. Also, in applying the criteria the writer was obliged to make certain minor exceptions when qualifying circumstances were present, especially with regard to the criterion of dominance. For instance, the social smile stimulus was a dominating factor over the food stimulus in determining the response of a three-month-old baby who had just been fed. Three to four hours after feeding-time, mere social approach might cause mouth opening for anticipated food instead of a smile. The drive that dominated under certain conditions or at a particular age was found to be subsidiary in importance on another occasion or age-level. Thus, the following statement with regard to the development of the major drives is based upon a general consideration of the infant behaviour observed together with reports and opinions of other writers.

THE ONTOGENESIS OF THE PRIMARY DRIVES

The law of survival operating in the human being takes the form of organismic adaptation both in behaviour and body structure. Processes of growth or expansion and development or differentiation take place until a certain optimum is reached. This is determined by internal and external limiting conditions. Along with the processes of growth and development there is also occurring a gradual synthesizing, an eliminating of parts and retrenching. It seems that during infancy the growth factors are dominant, while in old age the retrenching processes gain the upper hand.

The one basic drive would appear to be that of individual survival, an urge to live as a totality. The earliest responses of the infant are complete bodily reactions to any specific stimulation. The parts of the total response may not be well-organized to meet particular requirements, but the infant reacts as a whole, moving head, hands, body and legs. The new-born child behaves in such a way as to prolong its life and safeguard its integrity. This it does not only by

expansive movements and increased differentiation of response, but also by eliminating unsuitable activity and curtailment of energy expenditure.

There seems to be no need to postulate other basal or original drives in addition to the urge for survival. Jung, for instance, has suggested the existence of a regressive tendency to account for disintegrative mental processes, forgetting and lethargy. Freud, also, has invented a "death instinct" to explain hostility and self-punishment in later childhood. But these phenomena are all forms of defensive behaviour, protective in effect, and can be shown to be expressions of the great impulsion for life.

Patterns of behaviour become established as response tendencies on account of their adaptive value for life. The satisfactory outcome in comprehensive adjustment determines their potency as drives for further action. The accomplishment of this satisfactory adaptation becomes for the individual a part of the total situation-response experience. Upon recurrent stimulation, the memory or subconscious expectancy of gratification is then an integral part of the determining situation. Thus, the "idea" of the end becomes the motive for action, and its apparent cause. There is an "object-set" to all the major drives as well as to specific reactions.

Reflexes are developed as part of the more general adaptive responses. Coghill (12) in his studies of foetal behaviour, has shown that a ten-week-old foetus moves body and legs when the eyelid is touched, whereas at birth the response has already become narrowed down to the specific blink reflex. He says "all reflexes emerge as partial or local patterns within an expanding or growing total pattern that normally is from the beginning perfectly integrated." The writer would prefer to substitute "unified" for the word "integrated" in reference to the total foetal response. "Integrated" would apply better to the gradually organized and specialized behaviour of the more highly adapted child or adult.

Reflexes may thus be regarded as pre-natally acquired specific habits, and are but parts of the more general patterns of response called instinctive. Then, the various instincts themselves are particular forms of expression of the biological urge for survival of organismic integrity. It seems that the individual is constantly seeking something outside of itself to complete itself, and giving something out from itself to relieve itself, while temporary states of equilibrium or of suspended activity occur.

General exercise and rest are the first noticeable forms of infant behaviour; and these involve sensory exploration and utilization of the environment. Due to the convenience of circumstances and certain pre-natally acquired reflexes for material intake and elimination, the appetitive drives of breathing and feeding develop immediately after birth. They take on specific form as the result of diminution of useless activity and as they come to have direct reference to the end result which is found by experience to relieve organic tension most satisfactorily. These appetitive drives are determined at first more by internal stimulation through interoceptors and proprioceptors than externally through the exteroceptors. Later in the infant's development, from the age of two or three months, the sight of food prompts sucking and feeding activity.

Curiosity is a drive which makes its appearance very early, during the first and second month of life. Indeed it may be regarded as the explorative and seeking part of all adaptive activity. The shift of attention of the infant from a distant object to a near-by person and thence to a rattling sound or to his own hand are signs of enquiring curiosity or intelligent versatility. As the infant develops his curiosity becomes specific; he watches people's faces, plays with his toes, peers into boxes and later runs in and out of rooms. Curiosity is like memory, it is an attribute of general intelligence. Yet, just as a person acquires a good memory for this or that type of thing, so an individual may develop strong curiosity or interest in specific materials or subjects of

study. It implies incomplete perceptual grasp of a situation and sufficient previous satisfaction to cause repeated attack or further attentive examination.

The sense of incompleteness of perceptual grasp or comprehension may be due to the fact that the individual's activity is directed to a remoter end than the one attained, involving greater diversity and complexity of behaviour. The older the child or the more intelligent, the more distant his objective, that is the more extensive the experience required to attain it. At any age it would seem that the more intelligent child has greater power of differentiation of sense data. He responds to partial stimuli and is quickly satisfied with the result of each action insofar as it is a step in a total, more inclusive process of comprehension. His liberated attention then turns to another aspect of the perceptual problem. He is inquisitive and curious. Practical exploitation of the environment follows close upon successful exploration, as part of the general process of adaptive growth in behaviour. Again the bright child soon tires of easy solutions and tackles ever more difficult problems leading to remoter ends.

The dull child, on the other hand, is motivated by nearer goals and his behaviour is less versatile. The halo of satisfaction due to some partial success glows, so to speak, over the total behaviour, and he repeats the whole response including mistakes and unnecessary movements over and over again. The dull child, moreover, has a labile attention due to lack of organization of behaviour trends. He turns from one object to another as a result of fortuitous external stimulation. This lability can be distinguished from the alertness of an intelligent child whose attention shifts in a more orderly pattern in pursuit of unified interests. The stereotyped behaviour under slightly differing stimulation of the stupid child may also be contrasted with the varied repetition of the bright one.

Repetition of successful responses involving memory is a feature of all adaptive behaviour. It is an important factor in the establishment of the primary drives and in the development of socialized behaviour. Out of this repetitive tendency in the social situation grows the drive to imitate and mimic. The infant at first repeats his own pleasing activities; mouthing, fist-sucking, finger play and vocalizing. The sight or sound of his own behaviour becomes connected with the specific responses. Later, similar sounds and the sight of others behaving in the same way prompt the infant to respond in like manner. The imitation is by no means perfect at first. Increasing social approval and personal satisfaction determine the gradual perfection of imitative behaviour, while non-effective reactions are slowly eliminated. From eighteen months of age on through the pre-school period and later childhood the tendency to imitate gathers strength, fostered by social pressure and formal education.

In exploring, expanding, searching, the child may pass over or crush things in his way. A successful knock-out blow releases more neuro-muscular energy, which he spends in further exploration or in repetition of the destructive behaviour. In the case of the dull child this quickly achieved simple satisfaction becomes an end in itself, and destructive behaviour may be prolonged over an indefinite period. The intelligent child is less easily satisfied, the destruction for him was merely a way of overcoming an obstacle to his perceptual growth. It may have been only partially successful because the loss or destruction of the object of interest brought disappointment and a further check to his endeavours. On the other hand, along with social approval, it may have created new problems to be solved and opened up new vistas to be thus pleasantly explored. Bed-clothes, for instance, are first fingered curiously and pulled by the three-month-old, kicked by the five-month-old, and pushed away by the seven-month-old that he may examine his toes.

The overcoming of obstructive obstacles is a stepping-stone in behaviour development and comes to be one of the primary drives. The child repeats those surpassing or crushing performances which are successful in part at least in

changing environmental conditions to meet his needs. Pushing the crib bars which confine his movements the infant slides, and sliding makes further exploration possible.

Thus, incidental to discovering new kinesthetic, cutaneous, visual or auditory perceptions, the child learns the advantage of resisting obstructions. A tendency to resist or oppose intervention soon develops, at first directed against obtrusive objects and later against interfering persons. Within a few weeks after birth slight resistance to pressure is offered by head, shoulders and arms. By four months of age an infant will push a little with his feet. And by five or six months he not only presses with hands and feet, but he begins to show some social resistance. Between one and two years of age a strong tendency to contrariness develops. This weapon the child may wield to considerable personal advantage.

By counter attacks, in the social situation, the eighteen-month-old often succeeds in overcoming intervention and achieves his end. For instance, an infant will recapture his toy after hitting the child who took it away from him. He may strike so hard as to cause violent vocal protest and hitting in return, partly through imitation but mostly in opposition. The child then becomes so "intrigued" or attracted by this new-found way of controlling the social situation, that he is deterred from his original objective in favour of "getting-even". Varied exploration leads to the discovery of numerous means of revenge. For example, one foundling infant of sixteen months quietly sat on a much stronger child of about the same age, who kept pushing him over or grabbing whatever he was holding.

The drive to "get-even" is expressive in part of the fundamental tendencies for balance and compensatory action, though it is mainly a social form of the oppositional tendency. Revengeful behaviour is so often successful in obtaining social recognition and control that a powerful "get-even" tendency is common in pre-school children who have developed a strong drive for self-assertion. The latter is generally the result either of continual frustration, or the pleasing flattery of excessive attention. In exaggerated form, then, the vengeful tendency becomes rather a drive to "get more than even" and dominate the situation.

Genetically speaking, the urge for survival shows itself upon birth first as a drive for exploration, for increase and differentiation of sensory experience. Finding obstacles the infant opposes them. In so doing, he discovers further experiential possibilities and satisfying adaptations. Either he overcomes the obstructions or he utilizes them in his progressive growth and adventurous reconnoitering. Each stage in his procedure serves as a basis for the next. Repeating successful performances on subsequent occasions, the child comes to develop a strong utilitarian drive for adaptive exploitation of parts of his environment. The four-month-old baby fingers his dress, the six-month-old pulls and sucks it, while the nine-month-old draws it over his face to shield himself from the gaze of a stranger.

Dropping small objects, tearing paper, and other easy forms of destructive activity are indulged in during the latter half of the first year. Such behaviour usually succeeds in exploiting both the material and social environment at the same time. It is not until about one year of age that constructive performances make their appearance. At this age the infant combines two objects for his use. He rattles a stick in a tin can, scribbles on a hard surface with a pencil, and builds a tower with two blocks. He creates something and becomes aware of himself as the producing agent. Attending to his product he modifies and improves upon it. Thus, the creative urge for construction has its beginnings. It is about this age that the child shows interest in his own excreta. Quite probably he regards them as creative products, comparable to his scribbled lines or block tower.

Returning to the new-born baby again, some experiences may be so intense and overwhelming as to cause emotional shock. Internal visceral adjustments are made, including increased glandular activity. More nervous energy is thereby liberated and many varied patterns of actions are innervated. There results a mutual blocking of motor responses and a temporary suspension of activity. Some general reactions follow, and whatever behaviour serves to reduce the stimulus is the one repeatedly favoured. This is usually a retreating reaction or continued immobility. Thus, a tendency to avoid obnoxious stimuli begins to develop. It makes its appearance almost immediately after birth, as does the tendency to oppose mechanical resistance. Opposing negative reactions and avoidance are both patterns of behaviour involving biologically protective reflexes acquired in the pre-natal period. One of the earliest signs of withdrawal is that from painful stimuli within the first month. Three or four months later the infant turns his head and squirms to avoid glaring lights or being fed unsweetened, lumpy food.

Besides living in a world of inanimate objects, the baby's environment from birth is also a social one including people. Along with food, comfort and warmth, the child is provided with an animated pantomime and social attention. Certain of the infant's reactions result in attracting or prolonging this entertaining attention. These responses tend to be repeated, and the child comes to seek attention. In so doing he influences and partially controls the movements of others. This further advantage results in the development of a strong drive for social recognition.

At first the infant explores tactually, olfactorily, and visually his human contacts like any others. Moving persons as such are singled out by him for special observation within the first few weeks. By two months of age his gaze follows a person's face. At three months he turns his head towards the sound of a human voice; and by four months he coos and kicks delightedly at any social approach. He laughs and smiles in playful response, and cries when the attentive person leaves him.

The five-month-old repeats his own vocalizations and movements; and gradually he discovers himself as the cause of these phenomena. About this time he begins to resist social interference with his activities. He stiffens and thrusts out his foot if it is held, and hesitates in responding to the playful approach of a stranger. He is becoming an autonomous individual; and for the next few months he explores the inanimate world and develops manipulative and locomotive skills, at times quite heedless of the social factors in his surroundings.

Later, between nine and ten months, repeating his own perceived movements and those of others, the infant discovers the social approbation and practical advantages that follow imitation. Mimicking then becomes a pastime and a tool for personal control of social and other events. He echoes sounds in his vocalization, then syllabic speech. And so, from one year onward he rapidly acquires a drive for vocal communication. His social dependence and subservience is again highly noticeable. In a few months' time, however, he recoils from too much social control; and by the age of eighteen months he is the contrary little run-away familiar to all nurseries.

Thus, the social drives develop from aimless exploration to appreciative acquiescence. Then follow definite attention-seeking and social responsiveness around four months of age. Resistance against interference, withdrawal from strangers, and personal assertion develop next, followed by imitation and social cooperation before the age of one year. Preferences for certain individuals later become noticeable, and obstinate social resistance is characteristic behaviour of the two-year-old.

At three years of age the child begins to show powers of social organization. He arranges dramatic play, for instance, with one or two children or a grown-up. In such behaviour his social suggestibility and affability are combined with, and

even subordinate to, a drive for self-assertion. Thus, ascendancy and "leadership" are but outgrowths of the general tendency to exploit and utilize parts of the environment, operating in a social setting.

Further socialization takes place during the pre-school years when the child adapts his own ends to accord with others' wishes; and so in pleasing himself he comes to serve the needs of others. This is the beginning of the drive for social altruism. In one of the foundling hospitals, for instance, during the rest period, a four-year-old boy who was ordinarily rather timid risked the stern reprimand of the attendant by leaving his place to help another boy struggling to fasten his suspenders. He was the last straggler from the wash-room, and the children were not allowed to lie down till they had fastened their buttons.

During the sociable, submissive and imitative one to two-year period, the child does not seem to differentiate clearly as yet between the self and the other. He responds to their situations as well as his own; for instance, he may cry for the other child's hurt, or at a threatening blow directed against his nurse. He treats his doll or his favourite playmate as though they were himself, by patting, feeding, dressing, and so forth. The child apparently identifies himself with familiar persons as a sort of extended ego, and resists the intrusion of strangers.

Between two and three the child's own personality seems to become isolated. He sets himself in opposition to others and shows social independence of conduct. But between three and four years of age the child learns some of the benefits of combined activity and social cooperation in little games of house or storekeeping. Then it is that the growing individual seems to adopt, or co-opt others into temporary groups of two or three. The child's behaviour with the adopted friend would suggest that there is still considerable personal identification. If the playmate is older he is patient and acquiescent in his company; and if younger he helps, teaches and protects him.

Here is the first sign of maternal protectiveness, a drive which may owe part of its strength to this identification of the self with the members of the familiar and friendly social set. Even animals may protect their offspring as part of themselves. It is well-known that as soon as young animals show signs of independent activity, the mother leaves them to take care of themselves and shows little further interest in them.

Not only does the pre-school child identify his best friends with himself, but he also behaves at times as if he were they. As Susan Isaacs has pointed out, he projects or introjects himself into their situation and dramatizes his behaviour accordingly. In so doing he shows clearly that by this age he can differentiate between himself and the other, although his socially functioning ego may include him. One of the most helpful ways of studying the nature and relative strengths of a child's own drives is by watching how he treats his dolls or playmates with whom he identifies himself. He treats them as he is accustomed to be treated, and has them do what he wants to do. In the same way the rôle that he selects to act is expressive of his own drives and ambitions, even if it is merely to squirm along the ground like an alligator.

Less favoured members of the social environment and strangers may have projected upon them the child's own behaviour tendencies which are usually met with reprimand and checks. The child treats them as if they were the "bad" part of himself, and scolds, punishes, or shuns them. Again, observation of the way children behave with regard to those they dislike gives further clue to their own drives and behaviour conflicts. Any person and even the rag-doll may be treated with favour or disfavour at different times, dependent upon recent events which have encouraged, checked, or handicapped the child. He may identify himself in his actions with the constraining authority and scold or impede the other self-surrogate. Or, he may emulate the behaviour of the object of his affection-

ate attachment in flattering pantomime. Here we see among children at so early an age the origin of the social scapegoat and hero.

There is no sex difference noticeable in this self-projection and personal identification in the social behaviour of the child. Boys have their doll attachments, and boys or protect smaller children just as do the girls. Both sexes of infants show a preference for mothers and nurses among the adults, on account of the comforting treatment received from them. In the foundling hospitals the children could not have Oedipus or Electra complexes, as they were always tended by nurses in uniform. The resident physician, also in a white coat, would only visit the infants occasionally. The nurses no doubt showed preferential treatment towards the babies, according to their temperaments, and some received more attention than others. But every child was the favourite or special care of somebody.

Sex differences in behaviour and preference for companions are mainly socially determined. The behaviour and remarks of adults varied in local traditions influence and encourage certain types of comportment among the children. This influence is greater in some family circles than others, and may begin to operate during the socially suggestible one to two-year age period. Sex attachments, however, are of secondary and minor importance to the general personal-utility motive of the growing child. The sex instinct, so-called, can hardly be regarded as a primary drive in early childhood, for it does not show signs of being a dominant motive force in behaviour till around the age of puberty, or even later.

It is generally agreed that boys are on the whole more boisterous in their play activities than girls. In a pre-school group girls may be seen to play together, drawn by common interests in less energetic games. Bigger boys may show solicitation and considerate attention towards the smaller girls. But this is probably because the younger girls in a nursery group are apt to be the weaker members most requiring assistance. If the smallest in the group happen to be little boys, they receive similar care and consideration. The same protective drive operates in both sexes. Though, when it is manifested by boys it is often taken for sexual interest, and, as expressed by girls it is called maternal instinct.

Just as in primitive races the women, the slaves and the "underdogs" show the most compassion towards one another, so in a group of pre-school children, the girls and the more delicate boys are apt to show greater sympathy and kindness in their behaviour. Again this is not an original sex difference but rather a matter of relative strength of constitution and difference in experience. Robust girls may be very bossy and rough in their protective behaviour. Children who are often ill may understand better the suffering of others. But, on account of their weakness and the pleasant pampering they generally receive, they are apt to be exacting in their social demands and indifferent to the needs of others.

Maturing infants in their gradual discovery of the world about them in their exploitation of its possibilities to facilitate living, become slowly aware of themselves in action as causal agents. In waving their arms and sucking their fists they see and feel their hands. Later they hear their own voices and find their toes. Different local motor functions develop at more or less definite regular stages during the first two years of an infant's life. Gesell and Bühler, among others, have charted these phases of maturation very carefully; and have shown how such orderly development of behaviour depends on the effect of gravity, position, contact stimuli, light, sound, and internal organic stimulation.

The attentive interest and primary drives of the infant, therefore, concern certain types of object and forms of motor activity at different age levels in conformity with this process of maturation. The one-month-old baby sucks his fist and gazes at distant objects, the three-month-old plays with his hands, the four-month-old laughs and kicks on social stimulation, and so forth. Psychoanalysts

have suggested that children go through phases of oral eroticism, then anal eroticism and narcissism in the course of their instinctive or "libidinal" development. Certainly children mouth and suck objects continually during the first ten months of their lives. But this is only one mode of their activity in exploring the environment. Lids are well supplied with tactile end-organs, and all parts of the feeding process are associated with the gratification of hunger. These actions, moreover, are often repeated.

Later, between one and two years of age usually, when the child is less developed in clothing, he becomes aware of his own eliminative processes. At the same time he is being socially trained. His attention is drawn to the eliminative functions; and he discovers more of his own creative powers and means of exploiting the environment, for example, by incontinence or retention. Besides appreciating the newly differentiated sensations and perceptions, the infant quickly learns to utilize these additional methods of attracting other's attention and making the social environment respond to his bidding. This phase gradually passes when the child runs about and discovers ever further and further possibilities.

The egotistical and often stubborn two or three-year-old is very busy exploiting his own capacities as a creative and controlling agent. He may be said to be narcissistic; he may be even called auto-erotic and auto-sexual, for often about this time he explores and manipulates his own genitalia. But these terms only refer to a limited aspect of the child's development at this period. Despite his self-absorption and obstinacy, he is very socially dependent and sensitive. He displays his productive play achievements continually for attention and approval. He mimics speech and manners, and takes especial delight in hitting, dragging things, and making a noise.

To talk of certain "erotic" phases in infancy, namely the oral, anal, and auto-erotic, as if these were fundamental drives expressed later in many specific forms of behaviour, seems to be rather misleading. Comparative studies of infants show that orally directed attention and behaviour is only one aspect of the adaptive activity of the human organism. One might just as well speak of the "arm-eroticism" of the four-month-old during the period of gesticulating and abortive attempts at grasping. One might equally well prefer to the babbling of the seven-month-old as "ear eroticism" or "vocal eroticism". The same argument would apply to the exaggeration of the importance of certain other aspects of infant learning in the extensive application of such expressions as "anal erotic" and "auto erotic".

To be sure, an obstinate child, one in conflict with his social environment, may utilize his power to withhold the evacuation of faeces as a means of controlling the authorities in charge of him. But he will also refuse to take off his shoes, follow the offending adult when out for a walk, or eat his food at mealtime. "Anal fixation", so-called, may well be an expression of obstinacy and thus a symptom of social maladjustment. But it can hardly be said to be the primary cause of the latter. Emotional disturbance, due to social conflict and inhibition of action, may produce such temporary functional disorders as constipation or diarrhoea, according to immediate conditions and the physiological constitution of the child. These can become fixated as habits depending upon recurrence of circumstances and the usefulness of the purpose served. They are not primary motives but specific aspects of social and personal adjustment to physiological and climatic conditions and local conveniences.

The psychoanalytic term "fixation" is a concept of general significance which can be applied to the establishment of certain strong habits or stereotypes. Dependent upon favourable accruing results, upon the recurrence of situations, lack of discrimination, and inability to explore further in a certain direction, a child may develop a repetitive tendency for some particular behaviour form, such as scattering toys about or chewing the paint off them. Stereotyped behav-

lour or habit fixations are often indicative of extreme conflict and opposition, or lack of native capacity to explore and adjust. They may also, however, be personally satisfying adjustments to relatively unchanging circumstances. The highly intelligent child cannot repeat indefinitely. Other interests, held in abeyance by the one activity, divert the child's attention and modify his reaction. Neurotic, emotional children, mostly under social stress, and the intellectually dull children go on repeating inadequate attacks upon a problem. In so doing they learn by hard knocks to differentiate, and they gather additional emotional energy to strive, to explore further and develop. Intelligent neurotics show little variations in their behaviour within a general pattern, while the stupid child's stereotypes are inflexible and specific.

Biting, which is quite a common reaction of two and three-year-olds, is regarded by psychoanalysts as expressive of the second oral phase of a child's instinctive development. He derives pleasure from biting rather than sucking, and may even bite his companions. This is taken to be a hostile social reaction and indicative of a fundamental motive of hostility. Freud, moreover, proposes the existence of a "death instinct" towards self-annihilation to account for this hostile motive. The "death wish" is projected outward on to some surrogate object or person, whom the child treats in an aggressive and antagonistic manner.

Close observation of infant and pre-school behaviour, however, suggests that biting on the part of a baby under a year may be a friendly act. It is but a variation of his generally appreciative exploration, in which he pokes, pulls, licks or tears attractive objects. Biting other people may prove to be an effective way of ordering the environment to further immediate ends, until deterred by severe social disapprobation. As mentioned previously, the two to three-year-old is passing through a socially refractory age, and he may hit upon biting as a temporary measure for getting his own way. One sixteen-month-old infant in the hospital bit and pulled the hair of another the same age, who repeatedly took his toys.

Pugnacity or aggressiveness is a strongly developed tendency towards social opposition, probably largely based upon early frustration of activity. It also depends upon robustness of health, muscular energy, and limitation in variety of interests. During the process of social training, it is quite possible that a child may become disappointed in his own conduct and ability to conform to adult standards. His disagreeable behaviour offends others and in so doing it thwarts his own socially determined ambitions. He hits out, consequently, in opposition to the retraining authority and also against himself whom he introjects into the other person. A child's hostile behaviour may thus sometimes be an expression of self-criticism. He "punishes" both himself and the other offending person in imitation of adult teaching methods.

In civilized countries, where there is much social discipline and formal education, children may develop a "sense of guilt", to use a psychoanalytic term, beginning about the pre-school period. It is an awareness of an internal conflict between drives for personal gratification and the avoidance of social disapproval. A frequent evolution of this conflict is in actual or fantasied self-punishment. By punishing or depriving himself of enjoyment the child incidentally becomes the emulated authority, while he continues to get satisfaction from his "guilty" or naughty behaviour.

Hostile behaviour, whether directed outward upon the community or against the self, is always an expression of the primary tendency to oppose frustration. It is determined by the primal urge for individual growth and survival. The recent psychoanalytic theory, on the contrary, holds that there is an original "death instinct", a drive for self-annihilation which manifests itself through the "punishment phantasy" and in all hostile behaviour. Antagonistic reactions are all supposed to be directed against the self masquerading in the other person. This seems to the writer to be a complete reversal of the order of things.

pugnacious behaviour is a sign of life; and any partially gratifying phantasy there may be accompanying it is rather that of death or destruction of the offender.

Even suicidal behaviour may be explained as an extravagant, and incidentally inadequate, expression of the life impulse. Firstly, it is most common during adolescence when the urge for living is strong and when social adaptations are still in the process of formation. The youth in his growing ambition identifies himself idealistically with the social group and adopts its standards of conduct. Childish behaviour tendencies assert themselves, impeding his progress. His glands are active, and he works up an emotional fury against the tiresome and tabooed tendencies in himself. Then, he may do violence to himself in angry revenge, and at the same time to force the attention of the social world upon such an awkward and apparently insignificant person.

Other cases of self-destruction may be partly defensive in aim. An individual may be so shocked and overwhelmed by difficulties, material and social, as to be emotionally inhibited in his behaviour. He reacts by recoiling from social influence; and suicide may be an ultimate retreat from danger. Again, this is a paradoxical manifestation of the drive for self-protection and individual survival.

Any of the numerous forms of "masochistic" behavior, self-sacrifice and abnegation can be shown similarly to be specific expressions of the life impulse. They are kinds of social adaptation in which the individual identifies himself with the group, the ideal "cause", or the person inflicting injury. The drive for expansive growth and for safe protection is manifested by parents in patient care of their offspring, their newer selves. Even the motherly little four-year-old, who suffers deprivation of her toys and painful escape from the younger child in her charge, is gaining adaptive control of the situation. In serving temporarily she inuree dependence of the little one and greater power of dominance for herself. At the same time she fondly enjoys the indulgent freedom and vigilant protection accorded to the younger child as if it were for herself.

Acts of retention seem at first to be rest pauses in the struggle for continued existence. The child holds on to the objective obtained before striving and exploring beyond. This may be just a stopping place, such as one step in a flight of stairs, or an actual toy object that the child coveted. Under one year of age babies rarely cling to anything for more than a few minutes. But the runabout child, between one and two and a half years, holds tenaciously to his toy animal and defends it from all claimants. Such strong possessiveness is determined in part by a conservative tendency to remain in a satisfactory position and avoid undue expenditure of energy; but it is also an expression of the drive for balance and personal integrity. The rest allows other interests to come into force and direct behaviour; and processes of organization and action planning or thought go on during this time.

Furthermore, the anthropomorphic infant seems to introject himself into the object of his choice. He apparently regards it either as a replica of himself or as an appendage; and for this reason he guards it as vigorously as he would defend himself. The year-old child is learning to use objects as tools. A stick is useful as the prolongation of an arm. So here is another factor in possessiveness, the clinging to any means of extending the possibilities of exploiting the environment. Playmates or friendly grown persons may be annexed and utilized in the same way.

Collecting small objects is a behaviour trend which makes its appearance usually during the pre-school years, and is doubtless another manifestation of ego-expansion and the drive to control the environment. It was noticed in one foundling hospital, where the children under two years of age had a variety of playthings, that the younger ones sought objects of any kind chiefly for their mani-

pulative potentialities. The older ones selected and clung to objects with pleasant familiar associations, things that were of "historical" value to them. Thus, acquisitive behaviour might be regarded as a manifestation of the drive to preserve personal integrity and continuity, in holding the past to the present for future development.

In the other founding hospital, observations were made on the behaviour of a group of three to six-year-old children, devoid of play materials, when leaves torn from a book were scattered among them. All the children tried to claim as many as they could, and several struggled or fought for possession. After a few minutes an optimum balance was reached. The more persistent and the older had the larger collections. Then the children treated the material according to the relative strengths of their more individual drives, and their general maturity level. Some put the papers in a heap and sat on them. Some tore them into little pieces. Others spread them on benches with edges touching together; and one or two pretended to read from the pages in mimic pantomime of adults.

Similar behaviour was shown on another occasion when handfuls of rags were distributed. The smaller children held the bundles firmly in their hands and carried them about. Some tied pieces together into long strings. One made a skipping rope, two made crowns, and two others belts. Some sat and smoothed out the material; while the oldest dressed herself in pieces knotted together.

According to Charlotte Bühler's observations, pre-school children under six collect any sort of material merely for possession. From seven years onwards they collect things which can be put to practical purposes, and the collections of adolescents are made for ideal ends. At each stage the objects are first chosen for their subjective value and later for more objective and social value. The writer, however, found infants amassing small objects even under the age of two years; while grasping one or two single objects is a common reaction after the age of six months. Some degree of selection was evidenced in the very earliest collections, depending apparently upon portability, brightness of colour, sound-producing properties, and general manipulative possibilities. Sometimes the behaviour of the three-year-olds towards their temporary possessions suggested that they had some symbolical representational value, signifying a person or a whole social event. At other times the objects were exploited as tools or building materials, use often being found for them after they were collected.

In the founding hospital experiment, the children who hoarded or merely clung to their materials were the younger or the relatively quiet and inactive ones of the pre-school group. The older and the more lively investigated the possibilities of their new possessions and put them to use. Timid children were afraid to display their pieces of stuff for fear of having them taken. Conservative behaviour may thus be an outcome of relative weakness and a sense of insecurity. The lack of drive involved may also be due to mental dullness and inflexibility and to temporary satisfaction in the attainment of an immediate end.

Both in their exploration of the inanimate world and in their social reactions, the founding children manifested waves of expansiveness followed by periods of retirement and self-absorption or active independence. The three-month-old became increasingly interested both in things that moved and in people. The seven-month-old manipulated objects but showed less interest in people. The eleven-month-old sought company again and was socially suggestible; while the eighteen-month-old would run away from the group or escape from the room, when possible, to investigate beyond.

Inhibited, shy behaviour, with bent head and averted gaze was acquired by some children during one of the socially resistant phases, that is, around seven, eighteen or thirty months of age; and it was preserved as a means of holding attention during the periods of greater sociability. Such bashfulness appeared to be an attempt at adjustment to satisfy two somewhat incompatible drives: that

for special attention fostered by social dependence, and the contrary drive to dominate rather than be controlled by the social environment. This awkward, shy behaviour was gradually modified as it proved to be inconvenient or even a social handicap.

In the case of highly suggestible children of pre-school age, retirement to a corner or bashful immobility seemed to be less a desire for attention than a conservative, defensive reaction against undue social stimulation and exploitation. In fact, it was a simple avoidance response to escape attention and reduce the overwhelming social influence. The same sensitive children were less shy in a small group of five or six than in larger groups of twenty or thirty.

The drives of universal importance in motivating behaviour developed in varying amounts of strength in different children. Although "physical energy," organic functioning, and native learning capacities had much to do with this; yet fortuitous arrangement of circumstances and the recurrence of events were seen to be powerful determining factors. One rosy-cheeked boy, who was a favourite among the nurses, had more practice than others in learning to walk and speak and operate the rocking chair. He developed a strong drive for domination both of the hospital attendants and the other children. He was persistently aggressive when thwarted, and by the age of eighteen months he succeeded in damaging several pieces of furniture through bumping it with his rocker.

Other children, due to their own peculiar circumstances, developed a cautiousness in behaviour, hesitating and retreating from the slightest difficulty. Certain children were acquisitive and grasping, possibly because of some unexpected or intense satisfaction thus derived. Moreover, the strength of a drive, such as that for possession, for social exclusion, or for leadership, was found upon analytical study to be due very often to "over-determination". The behaviour served several purposes and was the outcome of the amalgamation of two or more primary impulses.

Some of the more powerful drives developed during infancy showed periods of recurrent dominance in childhood. For example, sociability, contrariness, aggression, altruistic kindness and conservative possessiveness showed recurrent waves of dominance; but each time the behaviour took a slightly different form and had reference to different classes of objects or specific persons. Such periodic variations did not appear quite at the same age-levels for all children, although there was considerable correspondence. They could no doubt be accounted for by factors of general growth and maturation, organic and climatic changes, health, social customs, and the primary urge for balance and integrity. In all probability, recurrence in the dominant strength of certain drives might be traced throughout the whole life span.

The same order in development of the more specific behaviour tendencies was not followed invariably by all the infants under observation, due to experiential differences. But again, there was much similarity which could be attributed to the known orderliness of maturation during the first two years, and to the homogeneity in all children's environments. Only the fundamental urge for living is the same for every child. The adaptive forms in which it expresses itself must perforce vary with individual experience.

CONCLUSION

Primo vivere. The human organism's first and most fundamental behaviour drive is to extend and prolong its life and to preserve its individual integrity. This involves sensory discrimination and differentiation of response so as to effect environmental adaptation. Such reactions begin even before birth. Growth and useful coördination of response take place concurrently. But, according to the environmental conditions encountered, these adaptive reactions take various forms.

The infant at birth shows a tendency towards expansive exploration among mild and slowly changing stimulus patterns. He has already, also, a tendency to arrestation of movement upon sudden extensive change or intense sensory impact. Accumulated experience makes of this reaction a drive to avoid the obnoxious and whatever threatens personal security.

Explorative curiosity grows apace in all sensory fields during the first few weeks, from scents and surfaces to persons, small objects and voices. Integrative perception and manipulative exploitation are going on at the same time.

Physiological rhythms and appetitive intake and excretion are productive of the fundamental drives for functional balance, for breathing, feeding, eliminating, exercise and repose. Postural adjustment to gravity, based again upon muscle elasticity and reciprocal action, is the earliest form of a general tendency to compensatory reactions. This shows later in swaying movements, artistic symmetry in construction, and in moral judgment.

Obstacles to infant activity are met with resistance. This opposing reaction develops into negativism or contrariness at frustration in the social situation. Augmented by assertiveness it becomes aggression. Counter-attacks lead to the development of a tendency to revenge or "get-even."

Advantageous rest pauses between explorations, or attacks on problems, result in the establishment of a conservative tendency to retain hold. Objects first actively grasped, then conservatively held, come to be amassed as possessions. These are utilized mechanically; or they are given symbolic significance at least by the pre-school age, and treated dramatically as human surrogates. Acquisitiveness and possessiveness added to social antagonism can become stealing and hoarding.

Repetition of successfully adaptive behaviour in recurrent situations develops into imitation in the social setting. The tendency to imitate together with alternating assertion and submission constitute the drive for amicable social reciprocity.

Acquiescent social behaviour or submissiveness is based upon associated drives for appetite gratification and security, together with the growth drive for self-expansion. Assertiveness is at once an expression of the tendency to compensatory behaviour in a social situation in order to preserve individual independence of action, and a form of exploitation of the social environment. Altruistic behaviour develops from a useful combination of submissiveness and assertion; while maternal protective behaviour is a later development of self-protection through personal identification.

All of the above-mentioned fundamental drives develop within the first two years, excepting social altruism and protectiveness which are usually acquired between the third and fourth year. The primary drives become further differentiated and directed towards varying specific ends with increasing age. Combinations also continue to occur, the same objective serving as a goal and means of gratification for several basic drives. Sexual attractions and impulses complicate social behaviour during later childhood and adolescence, increasing the strength and specificity of social responses. Then follows the urge to propagate stimulated partly by increased genital activity, and expressing in yet another form the search for means of extending and prolonging life. Innumerable individual variations develop both in behaviour-form and object-set of the derived drives; but these all have their bases in the general adaptive responses acquired in the first and second year of life.

Appended below is a schematic outline, indicating the sequence of development of the primary drives from birth to the end of the pre-school period of childhood.

SCHEMATIC OUTLINE OF THE ONTOGENESIS OF THE PRIMARY DRIVES

Before Birth

The original, fundamental drive for individual survival operates through harmonious and economic adaption, involving principles of growth, differentiation, conservation, balance, elimination or reduction, and coordination.

Birth to One Month

General and special behaviour tendencies relative to environmental conditions evolve in a more or less definite order. Rhythmic exercise and rest, appetitive drives of breathing and feeding, sensory exploration, counter-action and compensation, avoidance, and utilization or exploitation all develop during the first month.

One to Three Months

Before the third month drives for tactual, visual and auditory curiosity, manipulation, postural adjustment, and sociability develop.

Three to Six Months

Tendencies towards acquisition, vocalization, assertion, shy retreat, and social submission make their appearance.

Six to Twelve Months

Drives for hostile aggression, imitation, destruction, and possession develop.

Twelve to Twenty-four Months

The drives for locomotion, creative construction, vocal communication, obstinate resistance, revenge, flight, and social compassion become evolved.

Two to Five Years

During the pre-school period tendencies towards social simulation and dissimulation develop involving processes of introjection and projection. Rivalry, collecting, protectiveness, and an urge for justice also make their appearance.

REFERENCES

- (1) Allen, A. H. B.: Pleasure and instinct. New York, Harcourt, Brace, 1930.
- (2) Babson, R. W.: Instincts and emotions. New York, Revell, 1927.
- (3) Bernard, L. L.: Instinct. A study in social psychology. New York, Henry Holt, 1924.
- (4) Boring, E. G.: Langfield, H. S., and Weld, H. P. Psychology; a factual textbook. New York, John Wiley, 1935.
- (5) Bridges, J. W.: Psychology, normal and abnormal. New York and London, Appleton Century, 1930.
- (6) Bridgee, J. W.: The meaning and varieties of love. Science-Art, 1935.
- (7) Bridges, K. M. B.: The social and emotional development of the pre-school child. London, Kegan Paul, 1931.
- (8) Bridges, K. M. B.: Emotional development in early infancy. Child Development, 3, 1932, 324-341.
- (9) Bridges, K. M. B.: A study of social development in early infancy. Child Development, 4, 1933, 36-49.
- (10) Bühler, C.: From birth to maturity. London, Kegan Paul, 1935.
- (11) Bühler, C.: The first year of life. New York, John Day, 1930.

- (12) Coghill, G. E.: The genetic interrelation of instinctive behaviour and reflexes. *Psych. Rev.* 37, 1930, 264-266.
- (13) Delabarre, E. B.: A petroglyphic study of human motives. New York, *Scient. Monthly*, November, 1935.
- (14) Drever, J.: *Instinct in man*. London, Cambridge Univ. Press, 1921.
- (15) Gesell, A. and Thompson, H.: *Infant behaviour*. New York, McGraw-Hill, 1934.
- (16) Ginsberg, M., Isaacs, S., Marshall, T. H., and Suttie, I. D.: A symposium on property and possessiveness. *Brit. J. M. Psychol.* 15, 1935, 51-63.
- (17) Hendrick, Ives: *Facts and theories of psychoanalysis*. New York, Knopf, 1934.
- (18) Holt, E. B.: *Animal drive and the learning process*. New York, Henry Holt, 1931.
- (19) Humphrey, G.: Extinction and negative adaptation. *Psych. Rev.*, 37, 1930, 361-363.
- (20) Isaacs, S.: *The psychological aspects of child development*. Univ. London Inst. Educ. Pub. London, Evans, 1935.
- (21) Isaacs, S.: *Social development in young children*. London, Routledge, 1933.
- (22) Klein, M.: *The psycho-analysis of children*. London, Hogarth, 1932.
- (23) Koffka, K.: *The growth of the mind*. New York, Harcourt, Brace, 1925.
- (24) Kuo, Z. V.: How are our instincts acquired. *Psych. Rev.*, 29, 1922, 344-366.
- (25) Letourneau, C.: *La sociologie*. Reinwald, 1892.
- (26) MacDougall, W.: *An introduction to social psychology*. London, Methuen, 1919.
- (27) Shirley, M.: *The first two years*. Minneapolis, Univ. of Minnesota Press, 1933.
- (28) Woodworth, R. S.: Object-set psychology: A preliminary name for an embryo system. Abstract in program of Am. Psychol. Assoc. meeting. Univ. of Michigan, 1935.

AN ANTHROPOMETRIC MEASURING BOARD

THOMAS F. CAREY ¹

The growth process of a human being is still an interesting field of research. Of recent years many studies have appeared dealing with various anthropometric measurements of children and young adolescents. Since no standard apparatus has been introduced for taking some of these measurements, it is frequently left to the resourcefulness of the investigator to construct his own equipment.

The writer was confronted with the problem of measuring a large number of boys in various institutions. The equipment necessary for this work would have to be portable and easily movable after being set up. Among the measurements desired were standing height, shoulder height, leg length, sitting height, span, length of foot and width of foot. Previous experience with the conventional measuring rods had shown how hard it was to keep the measuring rod at a right angle to the floor when taking such measurements as shoulder height and leg length. Furthermore, youngsters had a tendency to pull a shoulder up or to drop it while being measured. Likewise, a shifting of weight from one foot to the other was noticed while taking leg length. To overcome some of these difficulties a measuring board was designed to supplement the use of a Todd Tubular Measuring Rod.

The main purposes of the measuring board then were to assure uniform conditions under which each boy would be measured and to facilitate handling the metal measuring rod so that it would always be at a right angle to the standing plane of the subject.

The complete board stood seven feet high and twenty inches wide. The base board was four feet long and twenty inches wide. The whole was so constructed that it could be taken apart by removing ten screws and transported on the running board of an automobile. The vertical piece was at an exact right angle to the horizontal base. The whole board was mounted on rubber rollers which facilitated handling and storing while working in the field.

Glued to the vertical section of the measuring board was a strip of unshrinkable metric tape, marked off in centimeters and millimeters. In the vertical section there were three equi-distant lipped grooves three-quarters of an inch deep and four inches wide running the whole length. The center groove acted as a guide for a wooden right-angle triangle, eight inches by eight inches. This was used for taking standing height and sitting height. The lower surface of this triangle was fitted with a metal edge one-sixteenth of an inch thick. The purpose of the metal edge was to assure taking the measurements from the scalp of boys who had heavy, curly hair. The operation of this triangle is shown in Figures 1 and 2.

The two outer grooves of the vertical board acted as guides for a much larger right angle triangle which fitted down over the shoulders of the boys and was used in taking shoulder height. The operation of this piece is shown in Figure 3. It was found to be a great help in keeping the shoulders in their natural position while taking this measurement.

It may be added that both triangles described above fitted into their grooves snugly so that there was no give in any direction and further they were exactly parallel to the standing plane of the subjects.

Fastened to the base board and to one of the vertical supports on the left side of the measuring board were two slots with holes drilled the exact size of the measuring rod. Into these were inserted the first section of a Todd Tubular Measuring Rod. This arrangement was used in taking leg length and its operation is illustrated in Figure 4. When not in use the additional section

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Fig. 1



Fig. 2



Fig. 3



Fig. 4

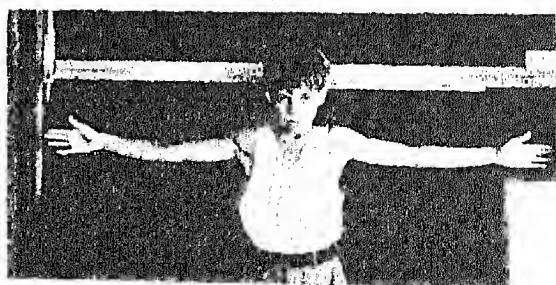


Fig. 5

PLATE 1

of the measuring rod could be taken off as shown in Figure 1 and 2, or pushed to the side as shown in Figure 3. This arrangement always assured the investigator that the measuring rod was at a right angle to the standing plane of the subject. He could then concentrate his attention on the actual taking of the measurement.

The box used for taking sitting height had three dimensions for its height, breadth and length, namely 25 centimeters, 30 centimeters and 40 centimeters respectively. This allowed for a different size box when measuring boys of marked difference in height. See Figure 2.

In constructing the Spanning Board the general recommendations given by Hrdlička were observed (1). A lip was planed into a smooth piece of white pine, seven feet long, four inches wide and three-quarters of an inch thick. The piece was then sawed in half and the two halves hinged together. A smaller piece of wood was then screwed to the lower edge (just visible along side the boy's left ear in Figure 5) and overlapped the hinge by about twelve inches on each side. This rendered the board about as rigid as it was before it was cut, and besides, upon removal of the smaller strip, it could be folded in half and conveniently transported. An unshrinkable metric scale was then glued to this board and afterwards shellaced. An ordinary draftsman T-square which slid along the groove in the top of the board gave convenient readings of span. Its operation is shown in Figure 5. While in use one end of the board was fastened at a moderate height to a door frame and the other end was supported by a wooden brace not shown in the picture. The length of the T-square made the board adaptable for both short and tall boys. The boys were asked to stretch their arms as far as possible and as they did the T-square was pushed back until the full extent of the boy's span was reached.

In Figure 3 there is seen hanging at the left side of the board opposite the subject's shoulder, a common foot rule used in most shoe stores for determining the size of shoe needed for a prospective customer. A metric tape was glued to the surface of the rule and then the whole was given a coat of shellac. This instrument was used for taking length of foot and width of foot.

The total cost of this whole set-up (minus the cost of the measuring rod) was a little less than seven dollars.

In order to determine the magnitude of the error of observation the measurements on thirty boys were duplicated on successive days, five boys from each preceding day being selected for re-test. The following average differences were thus obtained.

Standing Height.....	Mean Diff.	0.32cm.	±0.16
Shoulder Height.....	" "	0.57cm.	±0.37
Leg Length.....	" "	0.25cm.	±0.14
Span.....	" "	0.31cm.	±0.25

Besides being a great help to the accuracy of the measurements, the measuring board had the further advantages of being convenient, economical and portable.

REFERENCE

- (1) Hrdlička, Aleš: Anthropometry. Philadelphia, The Wistar Institute of Anatomy and Biology. 1920, p. 54.

PHYSICAL PROPORTIONS OF THE HUMAN INFANT

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INTRODUCTION

The different parts of the human body are often somewhat disproportionate in size. The tallest individuals are not always heaviest, those with longest legs do not always have longest trunks, and persons with widest hips may not have widest shoulders. When groups of individuals are measured, the lack of proportionality of different size measurements is often very noticeable.

Nevertheless, the different segments of the same human body do fit together, usually more or less harmoniously, to produce a whole human being with some symmetry and regularity of features. Since the parts must fit together, the different bones cannot vary in size with complete independence. Certain parts must agree in size more closely than others. For example, a person can hardly have a very long ulna and a very short radius; he can, however, have long fingers and short bones in the forearm. Some sets of bones must agree in length and width, but they could conceivably vary quite independently of many other sets of bones.

Since mechanical factors favor proportionality, and disproportion is prevalent, it appears likely that some factors favor independence of variation. Hence it seems desirable to examine the facts of agreement and disagreement. For a first analytic study of interrelationships, we have selected some published data based upon measurements of new-born babies. The correlations between such measurements are examined here in an attempt to discover trends. In the course of this procedure, we have employed multiple factor analysis as a useful technique for discovering trends and summarizing complicated collections of facts. This analytic treatment of the material directs attention to certain aspects which deserve more emphasis than they have usually received.

THE DATA

The data used in the present analysis are the correlations published by Bakwin and Bakwin (2). Those investigators made careful measurements of various dimensions of new-born babies, and they presented two tables of correlations. The first showed the intercorrelations between all possible pairs from among 18 external dimensions of 608 male new-borns. The second showed the same sort of intercorrelation figures obtained from measurements of 609 female new-borns. These data summarize certain facts about a very large body of anthropometric material, laboriously collected. The material is especially suited for the type of analysis intended here, since the number of variables is relatively large, the correlations are based upon large populations, and two separate intercorrelation tables permit comparative treatment, with consequent evidence concerning the consistency of findings.

The 18 measurements which were intercorrelated are discussed by Bakwin and Bakwin (1) in an earlier paper in which the method of taking the measurements is described. The reader will see by referring to our Table 1 that these measures include gross bodily dimensions, body weight, and various facial details. Some of these measurements are obviously composites, while others are measures of size of individual bones. It will be instructive to consider here in some detail the various amounts of agreement exhibited when such an array of variables is studied comparatively.

¹ From the Institute of Child Welfare, University of California. The writers are indebted to Dr. E. S. Conrad, Dr. H. E. Jones, Dr. E. R. Stolz, and Dr. Nancy Bayley, who read and criticized the manuscript.

GENERAL CONSIDERATIONS

In order to save space, the large tables of intercorrelations published by Bakwin and Bakwin (2) are not reproduced here. It is our intention, instead, to present some smaller arrays of figures, which summarize certain facts arrived at through study of those larger tabulations. We shall first point out some important features of the larger mass of data.

The values in the tables of intercorrelations are all positive, indicating a general tendency toward proportionality of all bodily measurements. The longer babies tend not only to be heavier, but also to have wider shoulders, wider hips, longer noses, wider ears, and so forth. The agreement extends to the comparisons of even the most diverse details. It would apparently be impossible to find two bodily dimensions which correlate negatively; among these 18, there are none which even correlate zero.

Certain selected and significant facts concerning these interrelationships have been presented in our Tables 1 and 2. For each variable, the value of the highest correlation coefficient is given and the paired variable is identified.

Table 1

Highest, Average, and Lowest Intercorrelation Values, for Each of 18 Variables, From Bakwin and Bakwin, Table 6. Data from 608 Male New-Born Babies.

Variable	Highest Correlation	Avg. r	Lowest Correlation
Total Length	.69 (Sitting Height)	.39	.16 (Height of Nose)
Sitting Height	.70 (Weight)	.38	.14 (Height of Nose)
Bimalar Diameter of Face	.65 (Circumf. of Thorax)	.43	.32 (Height of Nose)
Upper Facial Height	.54 (Height of Nose)	.38	.25 (Inter-Inner Canthus)
Height of Lower Jaw	.37 (Biacromial Diameter)	.30	.19 (Bi-Iliac Diameter)
Height of Nose	.54 (Upper Facial Height)	.36	.14 (Sitting Height)
Breadth of Nose	.56 (Circumf. of Thorax)	.41	.21 (Total Length)
Inter-Inner Canthus	.46 (Bimalar Diameter)	.34	.21 (Length of Ear)
Length of Ear	.50 (Breadth of Ear)	.34	.20 (Sitting Height)
Breadth of Ear	.50 (Length of Ear)	.36	.23 (Total Length)
Biacromial Diameter	.72 (Circumf. of Thorax)	.51	.37 (Ht. of Lower Jaw)
Bi-Iliac Diameter	.73 (Circumf. of Thorax)	.44	.19 (Ht. of Lower Jaw)
Circumference of Thorax	.73 (Bi-Iliac Diameter)	.54	.37 (Ht. of Lower Jaw)
Length of Palm	.53 (Weight)	.42	.25 (Ht. of Lower Jaw)
Breadth of Palm	.61 (Circumf. of Thorax)	.46	.30 (Ht. of Lower Jaw)
Length of Middle Finger	.67 (Bi-Iliac Diameter)	.48	.27 (Sitting Height)
Leg Length	.61 (Total Length)	.44	.26 (Length of Ear)
Weight	.70 (Sitting Height)	.49	.23 (Height of Nose)

The lowest correlation is also given, and the paired variable named. Finally, the value of the average correlation is presented. These tabulations indicate the general tendency of the variables toward high or low agreement relative to one another, and in addition show the special cases of high and low correlation.

The highest correlations are those between variables which are obviously composites, and even these correlations are not extremely high. Among the highest correlations are these between total length and sitting height (.76 for females and .69 for males). This is not surprising because the one measure is included in the other. Considering the spurious nature of the agreements involved, it is surprising that the correlation is not higher. The results suggest that the two segments included in total height must be very largely independent. This is in

fact the case. The correlation between sitting height and leg length is .57 for males and .58 for females. This very modest agreement indicates a relatively great amount of independence of variation of the two sets of measures.

Table 2

Highest, Average, and Lowest Intercorrelation Values, for Each of 18 Variables, From Bakwin and Bakwin, Table 7. Data from 609 Female New-Born Babies.

Variable	Highest Correlation	Av. \bar{r}	Lowest Correlation
Total Length	.78 (Sitting Height)	.46	.18 (Height of Nose)
Sitting Height	.78 (Total Length)	.42	.16 (Height of Nose)
Bimalar Diameter of Face	.61 (Circumf. of Thorax)	.44	.27 (Height of Nose)
Upper Facial Height	.54 (Height of Nose)	.33	.22 (Sitting Height)
Height of Lower Jaw	.32 (Total Length)	.25	.11 (Bi-Iliac Diameter)
Height of Nose	.54 (Upper Facial Height)	.33	.16 (Sitting Height)
Breadth of Nose	.54 (Circumf. of Thorax)	.39	.20 (Ht. of Lower Jaw)
Inter-Inner Canthus	.47 (Bimalar Diameter)	.35	.26 (Upper Facial Ht.)
Length of Ear	.48 (Circumf. of Thorax)	.37	.20 (Ht. of Lower Jaw)
Breadth of Ear	.47 (Length of Ear)	.34	.21 (Ht. of Lower Jaw)
Biacromial Diameter	.69 (Circumf. of Thorax)	.47	.22 (Ht. of Lower Jaw)
Bi-Iliac Diameter	.66 (Circumf. of Thorax)	.41	.11 (Ht. of Lower Jaw)
Circumference of Thorax	.69 (Biacromial Diameter)	.54	.28 (Ht. of Lower Jaw)
Length of Palm	.53 (Weight)	.40	.23 (Ht. of Lower Jaw)
Breadth of Palm	.65 (Circumf. of Thorax)	.46	.26 (Ht. of Lower Jaw)
Length of Middle Finger	.64 (Bi-Iliac Diameter)	.44	.24 (Ht. of Lower Jaw)
Leg Length	.69 (Total Length)	.43	.26 (Breadth of Nose)
Weight	.72 (Total Length)	.47	.22 (Height of Nose)

In the case of males, the highest correlation, as shown in Table 1, is that of .73 between bi-iliac diameter and circumference of thorax. This correlation does not necessarily involve spurious elements. In the case of females, the correlation of bi-iliac diameter and circumference of thorax is .66. Excluding the obviously spurious agreement between height and sitting height, the highest correlation for females is that between weight and total length (\bar{r} is .72 for females and .66 for males).

The agreement of results from males and females indicates that the trends in the correlation tables are in general consistent. There are a few exceptions, as one might expect. For example, weight in males is a closer function of sitting height (\bar{r} is .70) than of total length (\bar{r} is .66), while in females weight is more closely correlated with total length (\bar{r} is .72) than with sitting height (\bar{r} is .68).

The lowest correlations for each variable would be hard to predict a priori, but their consistency is shown by the fact that they are much the same in the two tables. Inspection of our Tables 1 and 2 indicates that these trends cannot be accounted for in terms of unreliability of measurement alone, nor in terms of relative isolation of the body parts compared. A relative small detail sometimes correlates significantly higher with a large body measure than the latter correlates with some other large body measures. For example, length of middle finger correlates highest with bi-iliac diameter (\bar{r} is .67 for males and .64 for females), and this correlation is higher than that between total length and bi-iliac diameter (\bar{r} is .25 for males and .29 for females). Furthermore, it is interesting that the length of middle finger correlates with bi-iliac diameter more than the latter correlates with biacromial diameter (\bar{r} is .60 for males and .52 for females).

MULTIPLE FACTOR ANALYSIS

Thurstone's simplified multiple factor method has been applied to these data, in order to determine how many independent general factors must be postulated to account for the measured variance, and in order to ascertain so far as possible the nature of the factors so extracted. The assumptions underlying these techniques, and the procedures employed, have been discussed at length elsewhere (3,4). The further procedures indicated in a later and more comprehensive formulation of factor theory (5) have not as yet been applied. The preliminary facts about communality, specificity, and number of factors seem to be clearly shown by the simplified technique here used, and it is in these basic problems that our present interest lies.

It frequently happens that measurements originally selected for study are more or less in agreement; hence each may be regarded as measuring the same thing to a greater or lesser extent. Over and above this general agreement, there may be evidence of special tendencies of groups of variables to have something in common; furthermore, other groups may seem to disagree. Prevalent trends of analysis indicate an almost universal tendency of investigators to seek accurate description of the agreements and disagreements existing among their measurements. All this indicates the desirability of regarding the results of measurement, for purposes of argument, in terms of variables alternative to the original variables. Factor analysis is a technique which assists one in this undertaking. Simplification in thought is secured by dealing with independent variables chosen to replace the complexly-overlapping variables. Economy is secured by making the first factor account for as much as possible, and by making the subsequent factors in turn account for as much of the remaining measurement as possible. The methods of factor analysis are based on straightforward mathematical logic. They offer no substitutes for common sense and insight, but they do provide an impartial quantitative evaluation of results, which is often very stimulating. Let us now consider the results of application of these methods to data based upon measurements of 18 different bodily dimensions.

Table 3 is a much condensed presentation of the quantitative results of multiple factor analysis. Two separate analyses were carried out, dealing with the data on males and the data on females separately; for convenience in comparison, these results have been assembled in the one table. For each of four factors, the factor loadings are given for each variable. The sums of squares of the factor loadings are presented to indicate the portion of the variance of each variable measured by the four broad factors. The highest correlation coefficient for each variable is also given, as a measure which should lie between the communality and the reliability (generally speaking, a first approximation to the communality). The communality is that portion of the variance not specific to the single variable. Therefore it affects the correlations of the given variable with at least some of the other variables.

The first factor reflects the mild but general agreement of all the external dimensions. The first factor loadings are all positive, and comparatively heavy for each of the 18 variables. There is, however, a range of from .85 to .39. It is apparent that the relatively lighter loadings are those of the smaller measurements, which might be less reliable. It should be further noted however, that the less heavily-represented variables are those, such as details of face and head, which according to common sense may easily vary independently of gross bodily measurements. As indicated by Factor 1, however, not one of these 18 measures is entirely uncorrelated with any one of the others.

A second observation concerning this first factor is that (when the measures are paired as much as possible) the thickness measures are more heavily weighted than are the length measures. An exception is found in the ear measurements. It is very interesting that a measure such as bimalar diameter should be weighted as heavily as sitting height! It means that bimalar diameter tends to corre-

late with all the other measures, apart from special linkages, slightly more than does sitting height. And the fact that circumference of thorax is more heavily weighted than total length is certainly surprising. This can hardly be explained as due to unreliability of measurements. For some reason, various size measurements of the babies can better be predicted from circumference of thorax than from total length, or any other length measure.

Table 3

Results of a Multiple Factor Analysis of Intercorrelations of the External Dimensions of 608 Male New-Born Babies, Compared with Results of a Similar Analysis of Data from 609 Female New-Born Babies.

	Factor One		Factor Two		Factor Three		Factor Four		Sum of		Highest	
	Loadings		Loadings		Loadings		Loadings		Square		Coefficient	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Total Length	.60	.73	.54	.52	-.07	.05	.06	-.09	.67	.82	.69	.78
Sitting Height	.59	.65	.58	.51	.01	.03	.08	-.02	.70	.89	.70	.78
Bimalar Diameter	.72	.68	-.08	-.12	.27	.25	.09	.24	.60	.60	.65	.61
Upper Facial Height	.58	.52	-.10	-.18	-.39	-.42	-.11	-.11	.52	.48	.54	.54
Height of Lower Jaw	.48	.39	-.01	.08	-.16	-.13	.14	.11	.26	.19	.37	.32
Height of Nose	.53	.52	-.31	-.37	-.20	-.27	-.36	-.42	.57	.66	.54	.54
Breadth of Nose	.63	.61	-.29	-.37	.15	.09	-.10	.03	.52	.52	.56	.54
Inter-Inner Canthus	.52	.55	.04	.04	.13	.00	-.04	.12	.29	.32	.46	.47
Length of Ear	.53	.58	-.24	-.10	-.25	-.17	.28	.11	.48	.39	.50	.48
Breadth of Ear	.54	.53	-.19	-.11	-.25	-.28	.20	.18	.43	.40	.50	.47
Biacromial Diameter	.79	.74	-.06	-.00	.13	.10	.09	.05	.66	.56	.72	.69
Bi-Iliac Diameter	.68	.64	-.30	-.42	.33	.36	-.06	-.15	.66	.74	.73	.68
Circumference of Thorax	.84	.85	-.09	-.05	.24	.22	.11	-.01	.78	.77	.73	.69
Length of Palm	.65	.63	.14	.15	-.13	-.09	-.12	.01	.47	.43	.53	.53
Breadth of Palm	.72	.72	-.11	-.02	.07	.11	-.11	.02	.54	.54	.61	.65
Length of Middle Finger	.75	.69	-.28	-.28	.05	.10	-.17	-.14	.66	.58	.67	.64
Leg Length	.68	.67	.34	.34	-.07	-.06	-.04	-.18	.58	.60	.61	.69
Weight	.76	.74	.40	.56	.16	.13	.15	.03	.79	.70	.70	.72
AV. (Disregarding Sign)	.64	.64	.23	.22	.17	.16	.13	.11	.56	.55	.60	.60

The ranking of the 18 measurements according to the loadings of Factor 1 are similar for males and females. The two sets of ranks correlates to the extent of .88. Thus good agreement has been found when the results from two totally different samplings are compared.

Factor 1 is apparently a measure of size in general. It weights the thickness measures more heavily than the length measures, and the large bodily features more than the smaller details. Length measurements, thickness measurements, and other details of size have something in common. But none of these groupings is completely explainable in terms of a single factor. In fact, the major part of the variance is left unexplained. We must turn to subsequent factors for evidence concerning further components of the particular variables.

Table 4 is given in order to present in brief and convenient form the variables heavily represented in the later factors. The presentation is arbitrary but convenient, and additional details can be seen by consulting Table 3. Here the presentation of extreme loadings (positive and negative) furnishes a simple indication of the nature of the successive factors. They are of course successively less important, as shown by the small size of the loadings for the later-extracted factors.

It is not necessarily to be expected that the later factors will reveal clear-cut pictures of familiar trends. Perhaps we are ignorant of some of the trends in the data, and the nature of these factors may amount to a discovery of new facts. The original data all indicate that gross bodily features and details of head measurements do not agree perfectly, and that length and thickness measurements do not agree perfectly. Hence removal of Factor I, which reflects the agreements, leaves the relevant disagreements in relief. It appears that Factor II is a composite of contrast effects. The contrast seems to involve length measurements and weight positively weighted, and the measurements of face, hands, and pelvis negatively weighted.

Table 4

An Abbreviated Indication of the Variables Heavily Represented in the Several Factors. The Factor Loadings are Given for Males (M) and for Females (F) Separately.

Positive Loadings

Negative Loadings

FACTOR I

All variables are positively loaded, in both sets of data

FACTOR II

	M	F		M	F
Total Length	.54	.52	Height of Nose	-.31	-.37
Sitting Height	.58	.51	Breadth of Nose	-.29	-.37
Weight	.40	.36	Bi-iliac Diameter	-.30	-.42
Leg Length	.34	.34	Length of Middle Finger	-.26	-.28

FACTOR III

	M	F		M	F
Bi-iliac Diameter	.33	.36	Upper Facial Height	-.39	-.42
Bimalar Diameter	.27	.25	Breadth of Ear	-.25	-.26
Circumf. of Thorax	.24	.22	Length of Ear	-.25	-.17
Weight	.16	.13	Height of Nose	-.20	-.27

FACTOR IV

	M	F		M	F
Length of Ear	.28	.11	Height of Nose	-.36	-.42
Breadth of Ear	.20	.18	Length of Middle Finger	-.17	-.14
Bimalar Diameter	.09	.24	Upper Facial Height	-.11	-.11

We may reasonably assume that weight is a function of height to the extent indicated by the agreement in this factor, and second that features of face and extremities have some unknown bond with pelvic measurements. It would be very interesting to know what causal factor may underlie this linkage of details of face, extremities, and pelvic measurements. The factor analysis, of course, merely indicates the linkage and does not explain it.

The order of the second factor loadings for magnitude, from highest positive to highest negative, is not random. The rankings of second factor loadings for males and females are in very good agreement, as shown by a rank-difference correlation of .95. These consistencies suggest that the findings here obtained

from two independent sets of data merit some consideration, even if the conclusions must be regarded as more or less speculative at present.

Factor III contrasts some thickness or width measurements and their correlate with some details of facial measurements, with emphasis upon longitudinal features. Apparently, it is a contrast of height and width measurements, which does not extend to gross body length measures. There is excellent agreement of the findings from males and from females, as shown by a rank-difference correlation of .94 between factor loadings from the two sets of data.

The fourth factor is similarly of contrast nature, but it is less consistent. Remembering that the contribution to variance is proportional to the squares of factor loadings, we see from Table 3 that the fourth factor is a relatively unimportant component of most of the variables. The fourth factor loadings for males and females have a rank-difference correlation of .64, which shows a marked drop in consistency relative to the preceding factors. For practical purposes, this fourth factor may be considered almost negligible. We do not consider it entirely negligible, but the technique is such that successively-extracted factors become progressively less important, and this fourth factor makes a relatively slight contribution to most of the variables.

COMPLEXITY OF MEASURES

The data of Table 3 suggest that some of the measured variables are more complex than others, not merely in being composites, but in having more numerous independently-behaving components. For example, inter-inner canthus has heavy loadings for Factor I, but not for any other factors; leg length has heavy loadings for Factors I and II; biacromial diameter has extremely heavy loadings for Factor I, and no other heavy loadings; bi-iliac diameter has rather heavy loadings for the first three factors. These findings are approximately the same for the males and the females. They show that some of the measured variables have special tendencies to correlate with particular sets of the variables, more than with others. Some of the variables correlate with all the other variables to an extent which is relatively uniform.

DISCUSSION

Since the data analyzed in this report are based entirely upon measurements of babies, it is necessary to keep in mind the fact that the results may not apply to similar data from older subjects. At later ages, body proportions will have changed, and the interrelationships between dimensions may exhibit very different patterns. For this reason, it seems desirable to make comparative studies of tables of inter-correlations obtained at successive stages of growth. The present paper is devoted entirely to consideration of data from new-borns, and for this purpose the data seem appropriate because of the large populations and the extensive array of measurements taken.

In studying the two tables of intercorrelations of babies' dimensions, multiple factor analysis has been used as an aid in securing a more exact and illuminating summary of the existing tendencies toward agreement and disagreement. It must be emphasized here that we make no pretense of discovering causal relations. The analysis is structural, not causal, in the sense that dynamic factors may not be isolated. The analysis should be useful in the search for causal relations, only to the extent that the correlations themselves reflect the underlying dynamics.

The extraction of the first factor gives a more adequate idea of the extent of general agreement among the various dimensions, in relation to the amount of independence, and the various linkages which do not extend to all the variables. The second, third, and fourth factors indicate the presence and nature of correlation tendencies which remain after the general size factor is removed. The number of factors needed to explain the correlations is an indication of the

complexity of the determinere of bodily dimensione. The sum of squaree of factor loadings is a good approximation to the communality, or that part of the variance which each variable has in common with at least one of the other variables.

The sum of squares of factor loadings indicates for each variable what proportion of the variance is explainable in terms of the factors which have been extracted. This is rather illuminating, for it indicates the extent to which the variable may be predicted from knowledge of the other variables. The remainder of the variance includes chance factors, as well as specific factors. The factors specific to the single variable can be determined only when other correlated variables are included in the program of measurement. When we speak of the communality as an indication of the completeness of determination of the variable, we shall mean the extent to which its variance can be attributed to factors which it has in common with other measurements included in the present analysis.

When the variables are arranged in order of completeness of determination by the four factors extracted, the results are similar for boys and girls, with a few exceptions. The most completely-determined variable is circumference of thorax; the communality is only .78. The least completely-determined variable is height of lower jaw; here the communality is .26 for boys and .19 for girls. These values must be very low in relation to reliability, hence it may be inferred that there is much specificity. This fact is interesting, because the lowest communality values are for facial measures, of which there are eight in the group of variables studied. Scrutiny of the detailed results shows that the trends cannot be entirely explained in terms of variation in the reliability of different measures; nevertheless, complete explanation of those trends must take account of the variations in reliability. Unfortunately, although Bakwin and Bakwin do furnish indications of accuracy of measurements, they do not present the needed correlation coefficients, nor do they present data which permit calculation of the coefficients, nor do they present data which permit calculation of the coefficients of reliability. This fact constitutes the major limitation in the use of their data in the present analysis.

The sex differences deserve special mention. The total length of babies is much better determined (communality .82) for girls than for boys (communality .67). This means that total length of girls varies less independently of other bodily dimensions. Also, bi-iliac diameter is determined equally well with biacromial diameter of boys, but in girls the bi-iliac diameter is far better determined (communality .74) than is biacromial diameter (communality .56). To sum up these facts, total length has more independent variation in boys than in girls, and likewise width of hips has more independent variation in males than in females.

SUMMARY, CONCLUSIONS, AND SUGGESTIONS

A detailed study has been made of the intercorrelations between 18 external dimensions of new-born babies. The measures included gross bodily dimensions, face measurements, and measures of details of extremities. The correlations used were those published by Bakwin and Bakwin (2), consisting of two large tables, one based upon data from 609 girls and the other from 608 boys. Inspection of the original correlations, and multiple factor analysis, have led to the following observations:

1. All measurements of different parts of the babies' bodies show some positive correlation, but no two parts are highly intercorrelated.
2. No single factor can account for a major part of the measured variance, when widely different parts of human bodies are measured. If the measures may be assumed to be fairly reliable, specific factors are more important than general factors.

3. The results here are much different from those secured when the same method of analysis is applied to mental test data. The anthropometric data show greater complexity, lesser importance of each component, greater number of components, and greater specificity.

4. The intercorrelations to be expected between different bodily dimensions cannot be predicted logically, but they behave systematically. The data indicate the presence of linkages which could hardly be inferred from elementary knowledge of the measurement procedure.

5. The first factor apparently reflects the general agreement of all the measured variables, and the later factors indicate the presence of and nature of linkages which could not be explained by a single component. The consistency of the first three factors is indicated by the high coefficients of agreement of data from males and from females.

6. Length of body and width of hips vary independently of other bodily dimensions to a greater extent in males than in females.

7. There is much independence of measurements of lengths or widths of different segments. The independence is greater for length measurements.

REFERENCES

- (1) Bakwin, H. and Bakwin, R. M.: Body build in infants. I. The technique of measuring the external dimensions of the body in infants. *J. Clin. Investigation*, 1931, 10, 369-376.
- (2) Bakwin, H. and Bakwin, R. M.: Body build in infants. II. Anthropometry in the new-born. *Human Biol.*, 1934, 6, 612-626.
- (3) Thurstone, L. L.: The theory of multiple factors. Ann Arbor, Edwards Brothers, Inc., 1933.
- (4) Thurstone, L. L.: A simplified multiple factor method, and an outline of the computations. Univ. of Chicago Bookstore, 1933.
- (5) Thurstone, L. L.: The vectors of mind. Univ. of Chicago Press, 1935, pp. xv, 266.

A NOTE ON Z-SCORES AS A TECHNIQUE FOR TREATING SERIAL MEASUREMENTS OF ELECTRICAL SKIN RESISTANCE

MARION A. WENGER and ORVIS C. IRWIN¹

During the course of an investigation (2) involving serial measurements of apparent electrical skin resistance in human infants and adults, it became evident that subjects whose general level of resistance was low maintained a nearly constant level of resistance throughout a two-hour observation period. On the other hand when the resistance was high large fluctuations were noted. When the means in ohms of series of measures taken at five-minute intervals were correlated with the standard deviations of the deflections, the coefficient of correlation was .83 for infants and adults, and .94 for adults only. It follows that series of measures from differing levels may not be compared unless the data have been rendered comparable. Of the several techniques for comparing data which show a constant relationship, standard measures or Z-scores, as Kelley (1) has termed them, have been chosen because the mean and standard deviation from which they are derived are the most reliable measures of central tendency and variability.

Two applications of this procedure will illustrate its usefulness and at the same time justify it. Lower Figure 1 shows palm-palm and plantar-plantar resistance from one infant plotted in ohms on an abscissa adequate to receive the range of skin resistance values of the average infant subject. Although large fluctuations have been found to occur with changing muscular processes (2), it is apparent that the curve is practically a straight line. When, however, the data are converted into Z-scores their relative fluctuations are revealed in their true comparability to other series of measures at higher resistance levels.

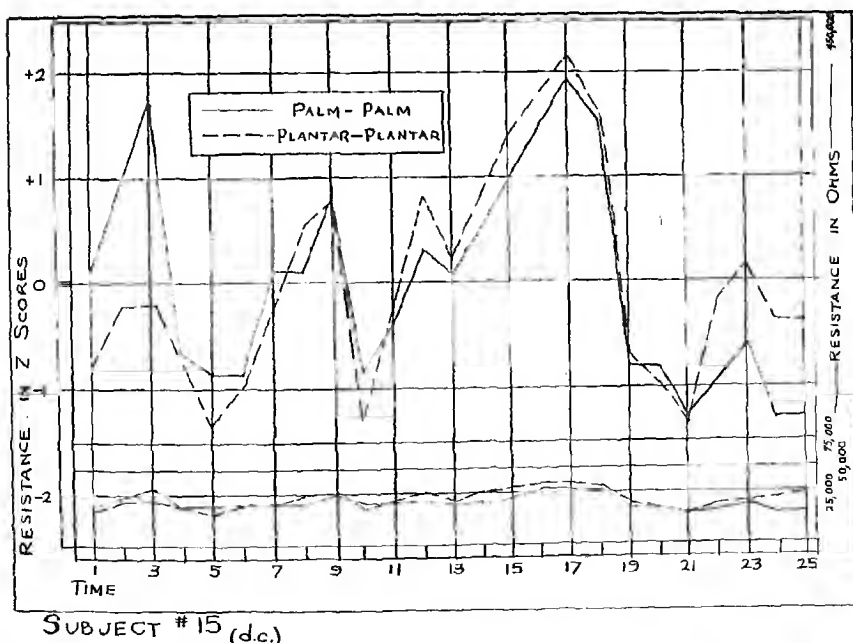
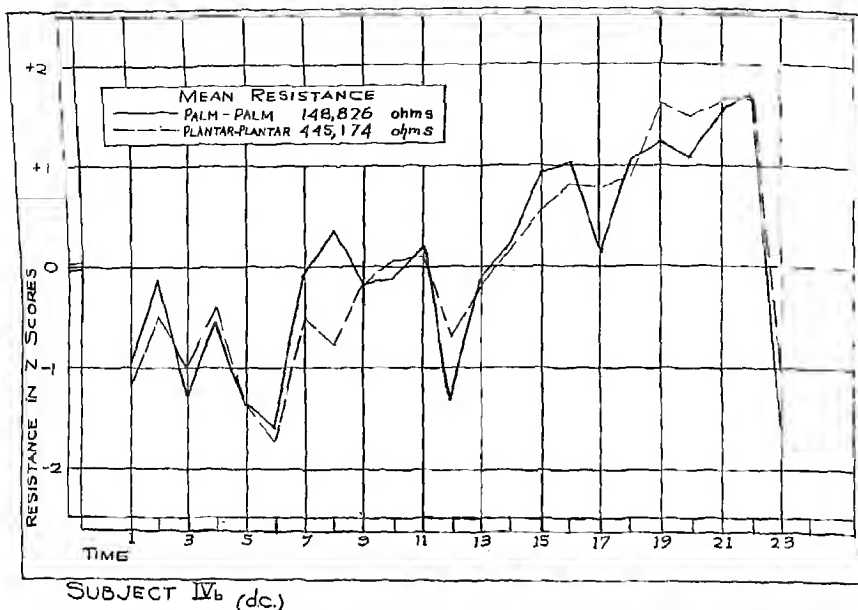


Figure 1 Palm-Palm and plantar-plantar resistance of one infant plotted in ohms



SMALL ELECTRODES ON PLANTAR SURFACES

Figure 2 Curve in Z-scores of widely disparate palm-palm and plantar-plantar measurements from one adult subject

Figure 2 shows the curves in Z-scores of widely disparate palm-palm and plantar-plantar measurements from one adult subject. It will be seen that the mean plantar resistance is approximately three times that of the palmar resistance. In this subject this difference is partially the result of the smaller electrodes used on the plantar surfaces. Had these values been plotted in ohms, large fluctuations would have been apparent in the plantar curve while the palmar fluctuations would have been much smaller. Their striking correspondence when plotted in Z-scores, corroborated by many similar examples in the forementioned investigation, is evidence of the corresponding physiological changes in plantar and palmar skin areas. The few deviations noted are explained by the fact that an interval of 15 to 30 seconds elapsed between palmar and plantar measurements.

In the light of these findings it is clear that serial measurements of skin resistance cannot be directly compared unless they fluctuate about the same mean. It is also clear that Z-scores furnish an adequate technique for comparing serial measurements fluctuating about different means.

REFERENCES

- (1) Kelley, Truman Lee: Statistical method. New York, Macmillan, 1923, pp. xi, 390.
- (2) Wenger, Marion A. and Irwin, Orvis C.: Fluctuation in skin resistance of infants and adults and their relation to muscular processes. Unpublished investigation.

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A BIBLIOGRAPHY OF BABY BIOGRAPHIES ¹

WAYNE DENNIS

Although it is customary to consider that the biographical period in child psychology belongs to the past and to hold that it has contributed relatively little to this field of knowledge, nevertheless many of the recent studies of child behavior have used baby biographies for background material. The writer is among those who have found this biographical material very useful. In utilizing the data of these reports, he found it necessary to compile a list of the published biographies. Although the biographical accounts are often referred to, no writer has made reference to more than a small part of the total number. To the writer's knowledge there is no bibliography of baby biographies. In view of the probable usefulness of such a list he presents one herewith.

The bibliography is reasonably complete, although it is inevitable that omissions will be found. The writer will greatly appreciate having omissions called to his attention.

The most useful sources of titles have been the Psychological Index, the Psychological Abstracts, the catalogs of the New York Public Library and of the Library of the U. S. Office of Education, and the annual bibliographies of child study which appeared in the Pedagogical Seminary, although scores of other bibliographies have been consulted.

It was not easy to decide what should be included as a baby biography. There is a host of accounts of language development in individual children, but several excellent bibliographies of these contributions are already available. To prevent a duplication of language bibliographies, it was decided in the present instance to include only accounts which deal with two or more phases of the development in the same infant. However, in any case in which the different phases of development of the same child are taken up in separate articles the entire group of articles has been included.

A more difficult question arose concerning the inclusion or omission of many general treatises on child psychology which are based in the main on records of the children of the respective authors. In general these works have been omitted on the ground that they are not primarily baby biographies. To list every book that contains some biographical material on early infancy would, it was felt, be impossible of completion; and even if carried out in part it would destroy the usefulness of the bibliography by filling it with a great quantity of irrelevant material.

Biographies have not been included unless they contain material on the first three years of life. While interesting and valuable material on the later years exists, it was decided to include only "baby" biographies.

The greatest labor has been incurred in discarding works whose titles indicated that they might be biographical contributions but which proved to be only generalized accounts based upon the works of other authors or upon an unascertained amount of general observation.

Brainard, P. P.: Some observations of infant learning and instincts. *Ped. Sem.*, 1927, 34, 231-254.

Braunschvig, M. and G.: *Notre enfant; journal d'un pere et d'une mere.* Paris, Hachette, 1913, pp. 264.

Brown, E. S.: *The baby's mind: Studies in infant psychology, Babyhood, 1890, 6, 239-242, 274-276, 305-307, 340-342, 369-372.*

¹ From the University of Virginia. Grateful acknowledgement is made to the Institute for Research in the Social Sciences at the University of Virginia for defraying part of the cost of travel to libraries which was necessary in preparing this bibliography, and to Mrs. Dennis for her assistance in consulting the literature.

- Buchner, M.: Die Entwicklung der Gemütebewegungen im ersten Lebensjahre, Langensalza, Beyer, 1909, pp. 19.
- Champanys, E. H.: Notes on an infant. *Mind*, 1881, 6, 104-107.
- Darwin, C.: A biographical sketch of an infant. *Mind*, 1877, 2, 285-294. Reprinted, *Popular Sci. Month.*, 1900, 57, 197-205.
- Dearborn, G. V. N.: Moto-sensory development: Observations on the first three years of childhood. Baltimore, Warwick & York, 1910, pp. 215.
- Dix, K. W.: Körperliche und geistige Entwicklung eines Kindes. Band I. In-
stinctbewegung. Leipzig, Wunderlich, 1911, pp. 79. II. Die Sinne. Leipzig,
Wunderlich, 1912, pp. 176. III. Vorstellen und Handeln. Leipzig, Wunderlich,
1914, pp. 148.
- Fenton, J. C.: A practical psychology of babyhood. New York, Houghton Mifflin,
1925, pp. 348.
- Friedrich, G.: Psychologische Beobachtungen an zwei Knaben. Langensalza, Beyer
& Sohne, 1906, pp. 74.
- Greenwood, A. K.: Das Erste Halbjahr eines Säuglings. *Int. Zsch. f. Indiv. psychol.*,
1933, 11, 464-467.
- Hall, G. S.: Notes on the study of infants. *Ped. Sem.* 1891, 1, 127-138.
- Hall, Mr. W. S.: The first 500 days of a child's life. *Child Stud. Mo.*, 1896-
1897, 2, 330-342, 394-407, 458-473, 522-537.
- Hazzard, F. W.: Development of an infant in grasping, reaching, and body move-
ments. *Child Development*, 1931, 2, 158-160.
- Hogan, L. E.: A study of a child. New York, Harpers, 1898, pp. 220.
- Ischikawa, T.: Beobachtungen über die geistige Entwicklung eines Kindes in
seinem ersten Lebensjahre, Beiträge zur Kinderforschung und Heilerziehung, 1910,
7-53.
- Kö, C. H.: (Psychology of a girl infant). Shanghai, Child Book Co., 1933, pp. 97.
- Krause, P.: Die Entwicklung eines Kindes von der Geburt bis zum Eintritt in die
Schule. Leipzig, Wunderlich, 1914, pp. 101.
- Lombroso, P.: *Saggi di psicologia del bambino*. Torino, Roux & Co., 1894,
pp. 284.
- Lowden, T. S.: The first half year of an infant's life. Post-grad. & Wooster
Quart., 1895, pp. 30.
- Machado, B.: *As creancas*. Notas dum pee. Coimbra, Portugal, Imprensa da Uni-
versidad, 2nd ed. 1904, pp. 416.
- Major, D. R.: First steps in mental growth. New York, Macmillan, 1906, pp. 360.
- McLeish, Mrs. A.: Observations on the development of a child during the first
year. *Trans. Ill. Soc. Child Stud.*, 1898, 3, 109-124.
- Meyer, T.: (editor) *Aus einer Kinderstube*. Tagebuchblätter einer Mutter.
Leipzig, Teubner, 1914, pp.
- Moore, K. C.: The mental development of a child. *Psychol. Rev. Monog. Suppl.*,
1896, 1, No. 3, pp. 150.
- Moore, K. C.: Comparative observations on the development of movements. *Ped.*
Sem., 1901, 8, 231-238.
- Munro, M. F.: Three years in the life of a child. *Educ. Rev.*, 1898, 16, 367-
377.
- Myers, G. C.: Motor emotional expressions of an infant. *J. Phil., Psychol.*,
and *Sci. Meth.*, 1915, 12, 44-45.
- Myers, G. C.: Grasping, reaching and handling. *Am. J. Psychol.*, 1915, 26,
525-539.
- Myers, G. C.: When does a body begin to think. *J. Phil., Psychol.*, and *Sci.*
Meth., 1918, 15, 132-133.
- Myers, G. C.: The evolution of an infant's walking. *Ped. Sem.*, 1922, 29, 295-
301.
- Myers, G. C.: Infants' inhibitions. A genetic study. *Ped. Sem.*, 1922, 29,
288-295.
- Noyes, A. G.: How I kept my baby well. Baltimore, Warwick & York, 1913, pp. 193.
- Neugebauer-Kostenblut, H.: Ueber die Entwicklung der Frage in der frühen
Kindheit. *Ztschr. f. angew. Psychol.*, 1913, 145-153.
- Neugebauer, H.: Kind und Musik. *Ztschr. f. päd. Psychol.*, 1929, 30, 46-49.
- Neugebauer, H.: Das Gefühls- und Willensleben meines Sohnes in seiner frühen
Kindheit. *Ztschr. f. angew. Psychol.*, 1929, 34, 275-310.

- Neugebauer, H.: Materialien zur Kindespsychologie. *Ztschr. f. angew. Psychol.*, 1929, 32, 294-320.
- Neugebauer, H.: Das Denken und die Intelligenz meines Sohnes in seiner frühen Kindheit. *Ztschr. f. angew. Psychol.*, 1930, 33, 393-437.
- Neugebauer, H.: Spiel und Phantasie in der frühen Kindheit meines Sohnes, *Ztschr. f. angew. Psychol.*, 1932, 42, 220-258.
- Oatman, M. E.: A boy's development at eighteen months. *Ped. Sem.*, 1921, 28, 52-59.
- Perez, B.: *Les trois premières années de l'enfant*. Paris, Balliere & Co., 1878, pp. 294.
- Preyer, W.: Psychogenesis. *Deutsche Rundschau*, 1880, 23, 198-221. (Translation into English appears in *J. Spec. Philos.*, 1881, 15, 159-189).
- Preyer, W.: *Die Seele des Kindes*. Leipzig, Grieben, 1882, pp. 424.
- Prior, M. D.: Notes on the first three years of a child. *Ped. Sem.*, 1895, 3, 339-341.
- Queck-Wilker, H.: Ein erstes Lebensjahr. Beobachtungen an einem Kinde nach Tagebuchaufzeichnungen. Langensalza, Beyer & Söhne, 1912, pp. 56.
- Rasmussen, V.: *Child Psychology*. I. The soul life of a child in its first four years. New York, Knopf, 1922, pp. 166.
- Rasmussen, V.: *Diary of a child's life from birth to the fifteenth year*. (trans. by M. Blanchard) London, Gyldendal, 1931, pp. 187.
- Scupin, E. and Scupin, G.: *Bubi im ersten bis dritten Lebensjahre*. Leipzig, Grieben, 1907, pp. 264.
- Shinn, M. W.: Notes on the development of a child. Part I. Univ. of California Pub. in Educ., Vol. 1, Berkeley, The Univ. Press, 1893-1899, pp. 424.
- Shinn, M. W.: Notes on the development of a child. II. The development of the senses in the first three years of childhood. Univ. of California Pub. in Educ., Vol. 4, Berkeley, The Univ. Press, 1904, pp. 258.
- Shinn, M. W.: *The biography of a baby*. New York, Houghton Mifflin, 1900, pp. 247.
- Sigismund: *Kind und Welt*. Vätern, Müttern und Kindefreunden gewidmet. I. Die fünf ersten Perioden des Kindesalters. Braunschweig: Vieweg, 1856, pp. 221.
- Simpson, W. G.: A chronicle of infant development. *J. Mental Sc.*, 1893, 39, 378-389, 498-505.
- Strumpell, L.: Notizen über die geistige Entwicklung eines weiblichen Kindes während der ersten zwei Lebensjahre. In *Psychologische Pädagogik*, Leipzig, Georg Böhme, 1880, pp. 368.
- Sully, J.: *Babies and science*. Cornhill Mag., 1881, 43, 539-554.
- Sully, J.: *Studies of childhood*. New York, Appleton, 1903, pp. 399-480.
- Talbot, E.: Papers on infant development. *Educ. Dept., Am. Soc. Sci. Assoc.*, 1882, pp. 52.
- Tiedemann, D.: Beobachtungen über die Entwicklung der Seetenfähigkeiten bei Kindern. *Hessischen Beiträge zur Gelehrsamkeit und Kunst*, 1787, Vol. 2, p. 313 -- Vol. 3, p. 486.
- Tilley, L. S.: Record of development of two baby boys. *Publ. of Assoc. Collegiate Alumnae*, 1910, Series 3, No. 22, 1-83.
- Tramer, M.: Die Entwicklungslinie eines psychotischen Kindes. *Schweiz. Arch. f. Neur. u. Psychiat.*, 1931, 27, 383-392.
- Tramer, M.: Tagebuch über ein geisteskrankes Kind. *Ztschr. f. Kinderpsychiat.*, 1934, 1, 91-97.
- Warden, C. J.: Notes on a male infant. *J. Genet. Psychol.*, 1928, 35, 328-330.
- Wynga: The mental development of the infant of today. *J. Psychol., Med. and Mental Pathol.*, new series, 1881, 7, 62-69.
- Zilahi, A.: Zur Erziehung des Säuglings. *Int. Ztschr. f. Individ.-psychol.*, 1929, 4, 287-296.

A GRAPHIC AGE CONVERSION SCALE

DOROTHEA MCCARTHY¹

In the literature of child development one encounters a variety of practice in the units employed for reporting age. While most people are accustomed to thinking of a child's age in terms of months for the first year or two, and in terms of years thereafter, many scientific investigators have, for the sake of accuracy, employed the smaller units of weeks or even days. When, as is often the case, these small-unit age designations are continued to higher age levels, the numbers involved become quite large and the age concept becomes rather meaningless to the usual reader who is unaccustomed to thinking in such terms.

If one wishes to compare the results from various laboratories one finds, for example, that the work of C. Bühler is expressed in years, months and days, that of Gesell in months, that of Shirley in weeks and that of McGraw in days. Reviewers in summarizing the literature usually carry over these different age designations from the original studies without making any conversion into comparable terms, so that several age units may be found in the same paragraph. The reader who is familiar with the literature will recognize that the following quotation is not an extreme instance; "Some experiments appear to indicate that thumb opposition occurs at about the 12th week while others place it at 6 months. Shinn notices the tendency for the thumb to reverse during the 9th week, and Jones records opposition in 50% of her cases at 149 days, and in 100% of her cases at 266 days "(2). In a recent volume (1) reviewing the literature there is a ten-page section on walking in which 16 studies are summarized. These ten pages contain 99 references to age, 33 of which are in terms of weeks, 29 in months, 28 in days, 4 in months of certain years, 4 in years and one in months and days.

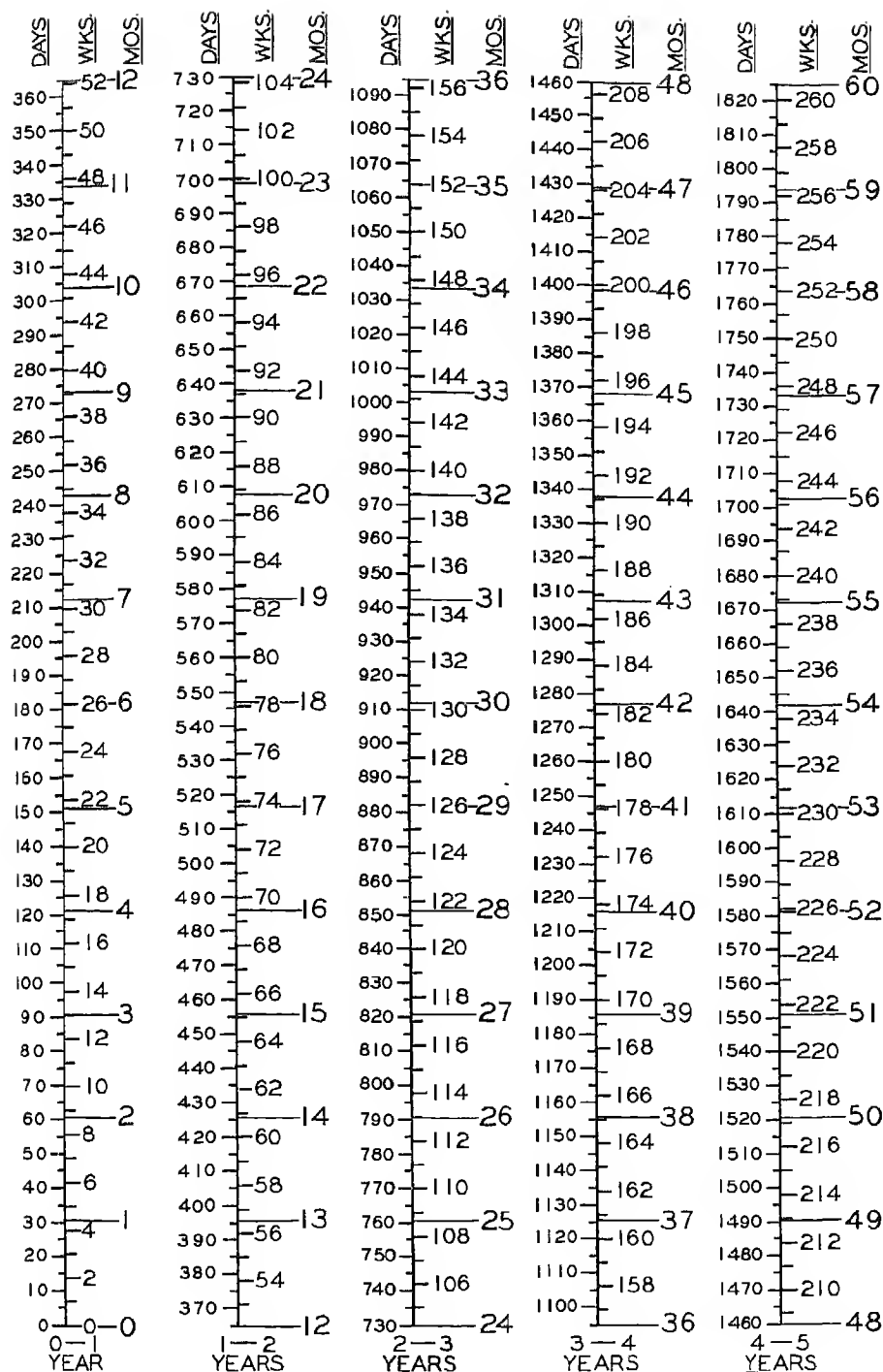
In reading such passages as the two just cited, the reader is forced to make many mental divisions or multiplications in order to determine the amount of agreement or disagreement among the various authors cited on the points at issue. He thus becomes chiefly concerned with the mental arithmetic involved, which, though simple, is sufficient to distract his attention from the full significance of the developmental sequences under discussion. It is indeed unfortunate that this unnecessary confusion exists, and it is to be hoped that some agreement making for greater uniformity in the designation of age in scientific writings can be reached. Until such uniformity is achieved, it is hoped that the accompanying line-graph may serve as a useful tool for the ready conversion of ages expressed in any one system of units to any other. It covers the age range from birth through five years with one vertical line representing each year. Days are indicated on the scales to the left, and weeks and months to the right of the vertical scales.

In the construction of the graph each 365-day year was divided into twelve equal months of 30.42 days, and into 52.14 weeks of seven days. Although the finest units marked on the scale are five-day units, the scale can be read quite easily to about the nearest day.

REFERENCES

- (1) Dewey, Evelyn: Behavior development in infants. Columbia Univ. Press, 1935, 175-184.
- (2) Halverson, H. M.: An experimental study of prehension in infants. Genet. Psychol. Monog., 1931, 10, p. 260.

¹
From Fordham University



COMMITTEE FOR THE STUDY OF SUICIDE

An organization to be known as the Committee for the Study of Suicide, Inc. was incorporated last December under the laws of the State of New York and began its activities early in January. The Committee may in time increase its present membership of ten to a total number of twenty. The Board of Directors and the officers of the new corporation are:

Dr. Gerald R. Jameison, President
Mr. Marshall Field, Vice-President
Dr. Henry Alsop Riley, Treasurer
Dr. Gregory Zilboorg, Secretary
and Director of Research

Miss Elisabeth G. Brockett
Dr. Franklin G. Ebaugh
Dr. Herman Nunberg
Dr. Dudley D. Shoenfeld
Dr. Bettina Warburg

The Committee plans to undertake a comprehensive study of suicide as a social and psychological phenomenon. To achieve this the following general outline was adopted.

1. Intramural studies of individuals inclined to suicide in selected hospitals for mental diseases. These will embrace constitutional, neurological, psychiatric and psychoanalytic investigations of the phenomenon with special reference to therapy and prevention. This part of the study will include the investigation of suicidal trends or ideas of death emerging in organic deliria.

2. Extramural studies of ambulatory cases afflicted with suicidal trends or with obsessional wishes for their own death. These studies will be primarily therapeutic in nature, the cases to be treated in especially selected out patient clinics and by qualified psychiatrists and psychoanalysts. Regular "control seminars" to follow and to supervise the course of the cases under treatment will be held under the guidance of the Committee. The medical and neurological status of all cases will be a prerequisite of each case record.

3. Social studies of suicide will be undertaken along the following general lines. Various attempts at suicide will be followed up by experienced psychiatric social workers; all cases will be studied from the standpoint of social background and history and those who failed in their attempts or have recovered from injuries following a partially successful attempt (prolonged unconsciousness or physical illness) will be urged to submit to psychiatric and psychoanalytic treatment in the hands of the intra- or extra mural therapeutic agencies which will be available to the Committee.

4. Ethnological studies, i.e. comprehensive investigation of suicide among primitive races, will be one of the first concerns of the Committee, for suicide is a rather frequent occurrence among many primitive races still extant and when studied may throw some light on suicide as a psycho-biological phenomenon. It is planned that an expedition headed by a psychiatrically schooled anthropologist, a psychiatrist and a psychoanalyst should work for a time in a region such as the Melanesian Islands or the Gulf of Papua, and in the interior of the Mexican North West as well as among some of the North American Indian tribes. Further details of this plan will be elaborated.

5. Historical studies of suicide will be pursued systematically under the auspices of the Committee, so as to make available a scientific history of the phenomenon as a social and medico-psychological problem.

The Committee was organized under the guidance of its first chairman, the late Dr. Mortimer Williams Raynor, Medical Director of Bloomingdale Hospital, who died on October 5th, 1935.

Dr. Henry E. Sigerist, Professor of the History of Medicine at Johns Hopkins University, and Dr. Edward Sapir, Professor of Anthropology at Yale University, are consultant members of the Committee. They will advise and guide in that part of the work which touches their respective fields. The Executive Offices of the Committee are located at Room 1404, the Medical Arts Center, 57 West 57th Street, New York City, and will be in charge of an executive assistant.

UNPLEASANT DREAMS IN CHILDHOOD

JOSEPHINE C. FOSTER AND JOHN E. ANDERSON*

Earlier studies of dreams have been concerned chiefly with the subject-matter of such dreams as happen to be remembered for some time, and with the possible significance or interpretation of these dreams. The present investigation was undertaken to determine the frequency of unpleasant dreams in children during a set period of time. Our interest was primarily in the proportion of children who report or give evidence of having unpleasant dreams; and secondarily with the factors that may condition such dreams.

The data were obtained from seven-day records kept by Minnesota parents on their children under twelve years of age. Every morning during the period, the answers to a set of questions about possible unpleasant dreams experienced by the child during the preceding night were recorded. Obviously, such a technique insures a higher validity of report than do estimates of the frequency of unpleasant dreams. By this technique, the probable changes with memory in the reports of dreams which occurred in the more remote past are minimized and the number of reports and the time of year at which the reports are made are controlled.

For each night of a week in the late fall of 1935, the parent answered the following questions:

1. Did you hear the child cry or moan during the night?
2. Did the child come to an adult during the night, showing fear?
3. Did child, when asked in the morning, remember having a bad dream?
4. If child had a bad dream, about how long did he cry or stay awake?
5. Do you know what he was afraid of? If so, what?
6. Has he had same or similar dreams before?
7. Can you think of any recent happening which might have caused the dream?

All of these questions, with the exception of the fourth, yielded data for analysis. Many reports on the fourth question, were so vague that no attempt to summarize the answers has been made.

In addition to the data recorded daily, the parents also reported the name, age and sex of the child, the ages of his brothers and sisters, whether or not the child slept in a bed alone, who if anyone shared his bed, who if anyone shared his bed-room, whether or not an adult could hear the child if he cried or whimpered in the night, what severe illness the child had had during the past six months and a judgment as to his present state of health.

In Table 1 the subjects are distributed by age and by place of residence. They come in much greater proportion from the large cities than from the rural areas when compared with the distribution of place of residence of children in Minnesota given in the 1930 census. In 1930 the proportion of 5-9 year old children living in the cities was one third, in towns, one fifth, in rural areas just under one half. Over two-thirds of our children come from cities, one eighth from towns and one sixth from rural areas.

TABLE 1				
Distribution of Subjects by Age and Place of Residence				
Ages	Number of Cases	Percentage living in		
		Cities	Towns	Rural Areas*
1-4	81	46.9	23.5	29.6
5-8	215	73.5	7.9	18.6
9-12	223	77.6	12.6	9.9
All Cases	519	71.1	12.3	16.6
1930 census (ages 5-9)		33.5	20.2	46.3
* Cities: population 50,000 and over; Towns, 2000-49,999; Rural areas, less than 2000.				

* From Institute of Child Welfare, University of Minnesota

Our group is, then, composed very largely of city children.

Table 2 shows the distribution of our cases by the socio-economic status of the family as determined by paternal occupation.

TABLE 2			
Distribution of cases by Minnesota Occupational Scale			
Socio-Economic Status	Percentage		
	Our cases	WHC sample	U.S. population 1930 census
I. Professional	30.6	2.7	2.6
II. Semi-Professional and Managerial	14.8	5.2	7.2
III. Clerical, Skilled Trades, Retail Business	32.0	15.7	13.8
IV. Farmers	5.6	18.0	15.4
V. Semi-Skilled Occupations, Minor or Clerical Positions Minor business	14.8	29.2	23.8
VI. Slightly skilled Occupations Requiring Little Skill or Ability	1.4	12.3	14.5
VII. Unskilled Laborers	.7	16.9	22.7

The second column shows the comparable distribution for the sample obtained for the White House Conference Studies¹, with which some of our data is later compared. The last column presents the distribution for the United States population according to the 1930 census. Our group has come overwhelmingly from the upper socio-economic strata. Although the proportion listed from the farming group is very small, actually the number should be higher. Some of our records were obtained through the cooperation of rural study groups. In some instances in these records, the occupation question was unanswered.

The educational level, in terms of the mean number of years spent in school, of the fathers in our group was 14.2 years with a standard deviation of 4.2 years, as compared with 9.9 years with a

standard deviation of 4.8 years for the White House Conference group. For our mothers, the mean educational level was 13.2 years with a sigma of 3.0 years as compared with 10.2 years with a sigma of 3.8 years for the White House Conference group. This shows that both the mothers and fathers of our group are well above the average cultural level.

There are two possible measures of frequency of unpleasant dreams: the number of children giving evidence of any unpleasant dreams during the week of recording; and the mean number of unpleasant dreams reported per child. Since the occasional child who has an unpleasant dream every night in the week will have a very great influence on the means of a rather small group, probably the presence or absence of any dreams is the more adequate measure.

TABLE 3						
Percentage Children Having Some Unpleasant Dreams During Week						
Age	Boys		Girls			Both Sexes Percentage
	No. of Cases	Percentage	No. of Cases	Percentage	D σ d	
1-4	40	42.5	39	43.6	.109	43.0
5-8	114	41.2	103	36.9	.644	39.2
9-12	110	21.8	111	22.5	.123	22.2
All ages		33.3		31.6		32.5

¹ Anderson, John E. (chairman). *The Young Child in the Home; a Study of Three Thousand Families*. D. Appleton-Century Co., 1936.

Table 3 shows the percentage of the two sexes in the different age-groups who gave any evidence of unpleasant dreams during the week. It will be remembered that in the questionnaire there are three possible indicators of unpleasant dreams: crying or moaning in the night; coming to the adult with show of fear during the night; reporting an unpleasant dream in the morning. In Table 3 positive evidence on any one of these three questions on any night in the week would place the child in the group having an unpleasant dream during the week. Practically no sex differences appear. Age differences, however, are evident since there is, with increasing age, a reduction in the proportion of children experiencing unpleasant dreams.

Table 4 based on the mean number of unpleasant dreams per week shows that the frequency of unpleasant dreams per child also decreases as the children grow older. When the various indicators of unpleasant dreams are considered, considerable variation between the age-groups is found. As children grow older, they moan less often in their sleep and come to the adult less often because they are

afraid. But reports of unpleasant dreams increase from the first age-group to the second, possibly because of a better memory of dreams, and a more accurate report. Thereafter they also decrease. In fact the mean number of unpleasant dreams reported for ages 9 to 12 is almost as small as for the very youngest group.

TABLE 4					
Evidence of Unpleasant Dreams (Moans per week per child)					
	Ages Both Sexes			All Ages	
	1-4	5-8	9-12	Boys	Girls
Moans during night	.81	.57	.17	.48	.38
Comes to adult	.18	.16	.05	.12	.11
Reports bad dream in morning	.21	.42	.26	.31	.21
Any evidence of bad dreaming	.93	.71	.39	.67	.54

TABLE 5				
Effect of Number of Siblings on Frequency of Unpleasant Dreams				
Children in family	Size of Family		Unpleasant Dreams	
	Our groups	WHC%	Mean No. per week	% Showing some unpleasant dreams
1	15.6	23.0	.58	31.6
2	38.9	27.1	.62	35.3
3	26.0	18.9	.59	32.4
4	10.8	10.6	.51	24.6
5	4.6	7.7	.37	31.6
6	2.3	5.0	.36	36.4
7+	1.9	7.7	1.50	40.0
Mean size of family	2.7	3.1		

In Table 5 the distribution of unpleasant dreams in families of different sizes is given. The first columns show that the children in this study come from families which are somewhat though not materially smaller than those studied in the White House Conference. The two remaining columns show that there is no relation between the number of children in the family and either the mean number of unpleasant dreams per week or percentage of children showing unpleasant dreams. The number of siblings then seems to have no effect upon the presence or absence of unpleasant dreams.

Table 6 distributes our data according to the conditions under which the child sleeps. Three fourths of the children for whom records were kept sleep in a bed alone, and a third have a room to themselves. Sleeping conditions seem to effect the frequency of unpleasant dreams. Both the smallest proportion of the children having unpleasant dreams and the smallest number of unpleasant dreams per week are found in those children who sleep in a bed alone and in a room alone.

The presence of another child in the room does not increase the number of unpleasant dreams to any great extent. The greatest proportion and highest frequencies occur where children sleep in a room with an adult and another child. Although it is possible that the larger number of dreams reported for children sleeping in a room with adults may be due to the fact that the adults can hear children in the room while they do not hear children sleeping in another room, practically every parent reported that the children's moaning or crying in the night could be heard. When a child sleeps in the same bed with another child both the frequency of unpleasant dreams and the proportion of children having them is increased. This increase is even more marked when children sleep with adults.

TABLE 6			
Effect of Sleeping Conditions on Frequency of Unpleasant Dreams			
	Sleeping conditions %	Unpleasant dreams	
		Mean No. per week	% showing some unpleasant dreams
In a bed alone	78.0	.57	32.1
With another child	5.1	.70	38.7
With an adult	16.9	1.00	45.5
In a room alone	36.8	.48	28.0
With another child	41.7	.56	29.0
With an adult	17.9	.90	39.2
With adult and child	3.5	1.13	52.2

TABLE 7				
Effect of State of Health upon Frequency of Unpleasant Dreams				
Health said to be:	No. Cases	Percent- age of cases	Unpleasant dreams	
			Mean No. per week	% showing some unpleasant dreams
Very Poor	0	.0		
Rather poor	1	.2		100.0
Fair	32	6.2	.94	34.3
Good	251	48.9	.62	36.0
Excellent	229	44.6	.48	31.7
Ill during last six months	56	10.9	.91	40.0
Not ill during last six months	459	89.1	.53	32.8

That the state of health of the child is related to the likelihood of unpleasant dreams is found in Table 7 which shows that the better the child's health the fewer unpleasant dreams are reported and (roughly) the larger the number of children showing no bad dreams at all. Table 7 shows also the data obtained in answer to the question as to whether or not the child had had a serious illness within

the last six months. Ninety-two percent of the children had not been ill. The mean number of unpleasant dreams in those who had been ill is much higher than in those who had not been ill; moreover, the number of children showing no evidence of unpleasant dreams during the week is higher among those who had not been ill. The reports suggest that certain illnesses (such as nose and throat difficulties) may be greater offenders than others in the matter of causing unpleasant dreams. Unfortunately no information on the exact date of the illness nor any measure of its severity is available. A further study might reveal a relationship between type of illness and frequency of unpleasant dreams during the succeeding months.

In Table 8 an attempt has been made to classify the subject matter of the dreams by both sex and age. In their unpleasant dreams, the youngest children dream most often about animals; the middle group about strange or bad people and about the impersonal types of danger such as war, fire and electricity; the oldest children about difficulties surrounding themselves, their friends or their pets. Girls are much more apt to dream about strange and bad people than are their

age	1-4	5-8	9-12	Boys	Girls
Personal					
difficulties	26.7	33.3	54.5	36.7	37.3
Difficulties of friends or pets	13.3	6.3	18.2	10.2	9.8
Animals (probably strange, or fearful)	40.0	15.9	9.1	18.4	17.6
Strange or bad people	6.7	20.6	13.6	9.8	24.5
The unknown, dark, etc.	6.7	7.9	.0	8.2	3.9
Loss of property	.0	4.6	.0	4.1	2.0
Impersonal danger	6.7	9.5	.0	10.2	3.9
Miscellaneous	.0	1.6	4.5	2.0	2.0

brothers; while boys show a much greater tendency to have dreams concerned with types of impersonal danger. It is possible that girls are more often warned to avoid strange men, and that boys have had more experience and therefore understand more clearly the dangers of fire and electricity.

In studying the reports of the parents as to the content of the dreams and the reports as to earlier events which might have caused the dream we have come to the following conclusions:

The content of the dream comes most often from experiences of the preceding day, particularly when these experiences are exciting or emotionally toned. Sometimes, but rarely, the content comes from earlier vividly unpleasant experiences.

Although the dream is occasionally an approximate repetition of an experience of the previous day, usually one character or event is taken from the day's experience and appears in the dream in a different setting or with an altered character. A dog who was friendly when seen in the afternoon may become an angry dog in the dream.

Certain states seem to predispose the child to unpleasant dreams. Among these, the most common are: over-excitement, fatigue, illness, indigestion and any unpleasant emotional state such as fears, worries or anger and quarreling.

Many of the mothers wrote in detail of their experience with unpleasant dreams either with the child upon whom report was being made or with older children in the family. Many of the reports on older children carried the note "Used to have bad dreams a few years ago." It was impossible to decide from these reports just when the peak of bad dreams had come for these children, but it was certainly before the age of 9 or 10. In table 9 a summarization of the mother's statements about the causes of dreams is made.

A variety of factors affect the dream process. These include the content of the experiences immediately preceding sleep and the outstanding events of the day, which may be carried over into the dream with a similar or a different emotional tone than that originally characteristic of them. In addition the physiological state of the child, as reflected in his state of health, recency of illness, fatigue, the character of his food, etc., affects the dream process. A third set of factors is related directly to the sleeping conditions, i.e. whether the child sleeps in a bed with another or in a room with another. Almost no recurrent dreams of the type which have been emphasized so much in the literature were reported. This may indicate that in young children, dreams, like waking mental

states, have relatively less organization than in older persons.

In children's dreams, it is quite possible that the boundary between latent content and manifest content is tenuous, and may in many instances not exist and that the disguise, distortion, condensation, etc., often so marked in the dreams of adults, may be of little or no significance. It must be remembered that because the dream is largely visual in character some transformation of content will take place. Anyone who has made attempts to represent verbal or emotional experiences pictorially, will realize the limitations imposed by representation of content in a visual form.

Freud assumes that basically all dreams are related to sex. The results obtained in this study offer little or no support for such a position. With persons in late adolescence and early adult life and with neurotic individuals with unresolved sex conflicts, it is possible that sex may be the most frequent determiner of the dream state. But the dreams of infants and young children seem to be closely related to their daily experiences and are affected by illness, the emotional events, excitement, vigorous play, etc., which occur just prior to sleep. The factors which affect the dream process change with age and with the shifting pattern of motivation and the organization of the psyche.

It seems to us that our results are most readily explained in terms of the analysis of the psycho made by Lewin² in the article on the Dynamic Theory of the Feeble-minded, in which he describes the psyche as possessing what are in effect three dimensions of which the first is concerned with the stratification of the psyche or its division into tension systems. The second involves the readiness of communication between these systems due to the firmness of their boundaries, and the third is the psychical content. As development proceeds stratification increases and the separation of systems increases. Content is a matter of the historical experience of the individual. Similar principles operate with reference to the genesis and differentiation of tension systems in the face of widely varying content.

In children the dream may be regarded as a tension system which originates either on the basis of an experience or an internal need and which takes from the psychic content a form which may or may not have a connection with underlying tension system. In our results there are dreams, set off by emotional excitement just before bed time or by a fearsome experience during the day, in which the dream content parallels the experience of the day. In other dreams originating on the same basis the emotional tone is opposite to that of the experience of the day.

The most interesting portion of the results is found in the tendency for un-

² Kurt Lewin. A Dynamic Theory of the Personality. New York: McGraw Hill, pp. 194-238.

TABLE 9	
Mother's statement of causes of bad dreams	
	Number Reporting
Over-excitement or fear	137
Physical condition of child	71
Noise during night	2
In particular out of 210 reasons given, we have: the following distribution:	
Frightening stories read or heard	31
Extreme emotional state of child	25
Illness	22
Fatigue	21
Radio programs	19
The day's experiences	19
Movies	18
Food or time food eaten	18
Conflicts with playmates	11
Physical condition at night	10
Too strenuous play	10
Funny papers	4
Noises at night	2

pleasant dreams to decrease with age. If sleep is viewed as the satisfaction of a need and development as a process of moving from a dynamically stronger gestalt to a weaker gestalt, this result becomes comprehensible. With development the boundary between sleeping and waking becomes more firm and the dynamic unity of the psyche weakens. On this basis tensions originating during the day would be expected to carry over into sleep less frequently as the individual grows older. In other words there is a sharper separation between the sleeping and waking state in the more mature person. Supporting evidence for this position is to be found in the observation frequently made that infants do not seem to be quite themselves for some time after awakening, whereas adults seem to be ready to function almost instantly upon awakening.

If sleep itself is viewed as the result of a tension system originating in a physiological need that moves toward satiation, or equilibrium, and Lewin's principle that the psyche as a whole may reach an equilibrium with a sub-system out of equilibrium, then it becomes clear that in sleep there is an inclusive tension system arising out of a need which overpowers the organism and which moves toward satiation irrespective of the tension in sub-systems. Presumably there may come a time when the primary need of the organism for sleep is partially met, i.e. the system as a whole has reached partial satiation. By that time the tension in the sub-system may become relatively so great that it will take command of the psyche.

Presumably the dynamic unity of the organism in sleep is greater than it is in the waking state. Sleep itself possesses some of the characteristics of a stronger gestalt. Hence, interruption or disturbance of sleep is an unusual rather than a characteristic phenomena.

SUMMARY

1. The study is based upon 519 one-week records of unpleasant dreams in children of 12 years of age or less, who come from families living in cities and families which rate above the average in education and in socio-economic position.
2. No reliable sex-differences appear.
3. The number of unpleasant dreams per child and the proportion of children having such dreams decreases with age.
4. The size of family appears to have no influence upon the frequency of unpleasant dreams.
5. Children sleeping in a bed alone show fewer unpleasant dreams than do those sharing a bed with another child and many fewer than children sharing a bed with an adult.
6. Children sleeping in a room alone show fewer unpleasant dreams than those sharing a room with another child. More unpleasant dreams are found when the child shares a room with an adult and still more when he shares the room with an adult and another child.
7. The better the general state of the child's health, the less frequent are unpleasant dreams.
8. Children between the ages of one and four have unpleasant dreams most often about animals, between ages five and nine about strange or bad people and about such impersonal dangers as war, fire and electricity; between nine and twelve about difficulties surrounding themselves, their friends and their pets.

SUMMARY - Concluded

9. The content of the dream is usually derived from exciting or emotionally toned experiences of the preceding day.

10. Children apparently are predisposed to unpleasant dreams by such states as: over-excitement, fatigue, illness, indigestion, fears, worries, anger and quarreling.

VARIATIONS IN EMOTIONAL RESPONSES OF CHILDREN

BUFORD JOHNSON¹

Observation of the everyday behavior of children in a Nursery School group suggests wide variability among children in emotional responses. Fortunate environment in conditioning of fears does not seem satisfactory as an explanation of the wide differences in the behavior of the child for ages eighteen months to five years of age in adjustment to new and varied situations. The child's perception of the situation may make it interesting or fear-provoking. Fear may change quickly into anger and the aggressive responses may be influential in elimination of fear.

Motivation of the child toward the end result or the goal to be reached is desirable for reduction of attention to the seemingly difficult situation presented to him. The difficulty then arises of the individual differences in ease of motivation. The question must be faced: What are the variations among children in these responses we term resistance or fear? Granting the efficacy of associative or conditioning methods in overcoming of fears, study of the child's perception of the situation or motive in response is important.

In this study the factor in the situation that was novel or difficult, that provoked discomfort or fear, was inherent in the response pattern. The three situations presented were planned for a progressive increase in motivation to succeed in a difficult situation. In the first series completion of a given task was the goal. In the second the desired object could be seen but could not be obtained except by responses involving the unpleasant factor. In the third situation the desired objects were a means of producing discomfort. In Series I and III a slight electric shock was the unpleasant factor. In Series II a loud sound was the only unpleasant factor in the experimental set-up though the child's previous experience in Series I introduced other factors. The sound had occurred in Series I without consideration of it as a disturbing factor. It was employed as an aid in recording responses. Our preconceived notions as to effect upon some children of such a sound were certainly erroneous. We had assumed that they would be interested in making the bell ring but we learned that it was highly disturbing to some children.

The ages of the children ranged from 29 to 69 months. Some children were in their third year at the Child Institute of the Johns Hopkins University. With four exceptions all had been attendants for the academic year. They were always eager to come to this experimental room for games and also knew the camera man.

SERIES I

A tracing board illustrated in the photographs offered the task of tracing with a stylus in a pathway. The bottom and sides of the path were of separate plates of brass. The stylus and tracing board were connected with high voltage terminals with sufficient resistance in series to give a shock of 3 tenths of a milliampere when the stylus touched the sides of the pathway. A bell of the ordinary type used for doorbells was wired in the series in such way that when the contact of stylus with side of pathway was made the bell sounded. The strokes of the bell were counted as a record of number of contacts made or of electric shocks received. The pathway was one half an inch wide and about one fourth of an inch deep. Previous study of the child's ability in tracing this pathway assured us that it would not be done without contacts. The child was shown how to hold the stylus and as the experimenter demonstrated, was told:

Begin here and go down this path until you reach this end. Do not touch the sides but stay in the path. Now you go down the path.

The stylus was then given to the child. No contacts were made in the demonstration and the sound of the bell was a new feature to the child. In later

¹ From The Johns Hopkins University.

trials with children who were disturbed by the bell the demonstrator touched the sides with the hope of alleviating fear of the sound.

It must be understood that we were not concerned with the child's ability to trace the path without contact but with his persistence in the difficult situation. The records as given for Series I show that some children were little affected by the bell or the shock and completed the task. Others were so upset by the sound of the bell that they would not continue. Some showed interest in making the bell ring and required much persuasion to move along the path. Some children put the stylus down immediately when a contact was made or the shock was received. Others were persuaded to continue.

SERIES I

TRACING BOARD WITH BELL AND SHOCK

Subjects	Age in months	Sex	Touches or shocks in Trials			Remarks
			1	2	3	
B. D.	64	Girl	7	6	12	
M. K.	69	Boy	5	5	5	
S. C.	62	Boy	5	5	8	
T. J.	62	Girl	9	10	5	Said "like to make bells ring"
S. F.	51	Boy	9	12	13	
B. F.	51	Boy	12	9	7	
J. P.	37	Girl	Did not keep in path. Enjoyed making bell ring.			
M. M.	35	Girl	Enjoyed first ringing. Started tracing path. Dropped stylus saying "It hurt", cried softly. Would not try again.			
S. A.	35	Girl	Slow to take stylus. After hearing bell touched several times then held against side with continuous shock and ringing. Dropped stylus. Refused to try again.			
T. M.	43	Girl	Slow to begin. Continued with slight urging. Kept bell ringing continuously but completed path. Would not try again. Said, "I not like that bell."			
H. K.	36	Boy	Would not try. Bell was sounded for him. Backed away, pupils enlarged. Longer ring was made. With trembling voice said he wanted to go back to his room.			
Z. J.	47	Boy	Backed away at sound of bell, pupils enlarged. Would not touch stylus but asked to have bell ring. Winced each time. Would not try.			
H. L.	47	Girl	After bell rang would not try. Tried to leave room. Was urged to try but refused.			
W. G.	46	Girl	Had fingers in mouth. They were dried but probably damp. Dropped stylus, immediately on contact. Would not try again.			
M. B.	36	Boy	Backed away at sound of bell, said "Turn off." Wanted B. J. to ring. On continued ringing repeated "Turn off", clinging to B. J. Was told he could go. Went to porch then returned asking B. J. to ring who made a quick ring. Took stylus but on contact dropped quickly, saying "My thumb, it hurt." Would not try again.			

SERIES I

TEST REPEATED ONE WEEK LATER

Subjects	Age in Months	Sex	Remarks
H. L.	47	Girl	Refused to stay in room, dashing out. Was urged to stay and see others do it. When two of her group came in who liked it, she said "I want to sit down." Took chair other side of room. Before one began tracing left room saying "I do not like that bell."
W. G.	46	Girl	Did not want to come in room. Was finally lured near table holding to hand of B. J. when asked to take stylus threw arms around B.J. begging to go.
M. E.		Boy	Wanted to hear bell but would not try. Liked repeated short rings but when prolonged wanted to leave room.
S. F.		Boy	Trial 1 - 8 touches; 2 - 9 touches; Occasionally sighed.
S. C.		Boy	Trial 1 - 7 touches; 2 - 7 touches. Played with making bell ring at different places. Wanted to know why some places would not make a ring.
M. K.		Boy	Trial 1 - 6 touches; Trial 2 - went back to beginning when he touched; tried not to touch. Completed with 5 touches.

One would require a picture of the total behavior pattern to understand the variability among the children in this situation. The photographic illustrations taken from moving pictures on second trials give some evidence of it. The strangeness of the tickle in the fingers from the shock often caused a look of consternation, pupils enlarged, and a general survey of all about them. Some said "It's funny" or "It hurts." Even in such cases they often looked toward the screen which concealed the shock apparatus and bell as though wondering if it came from there. Again they would move the stylus around in the air, suggesting wonder that the funny feeling had gone. Some put the stylus down immediately a shock was received and only with difficulty were persuaded to try again. The extreme exception was one who would not come into the room again.

We recognize that there are individual differences in susceptibility to electric shock though we state the amount of the shock given. Some gave no evidence of noting a tickle or pricking in the fingers. Some children remarked "It's funny" but made no objection to it. The loud sound was more objectionable to some than the shock. In a few cases it appeared that one contact gave a much stronger shock than previous ones. The child would suddenly drop the stylus and say "It hurt!" After such remarks some completed the task. Children tend to grasp the stylus low and with the whole hand and also change the grasping method during the performance.

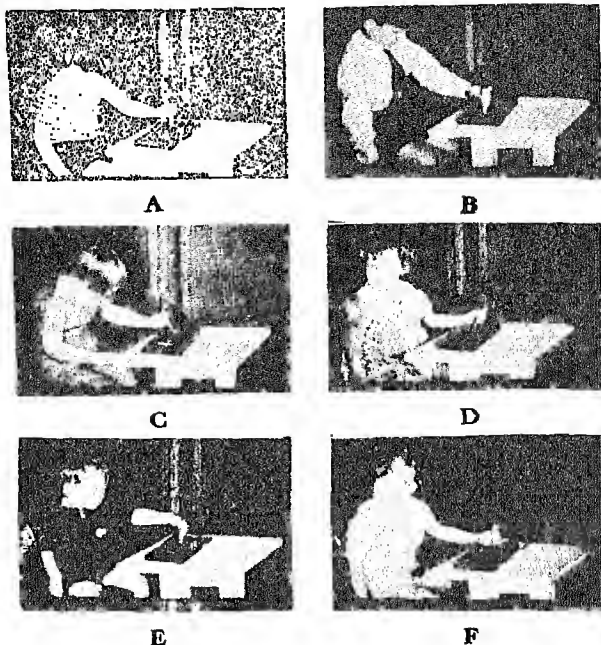


Figure 1.
Photographic illustrations for six children in Series I, showing five who were attentive to the task. Subject D liked the bell but disliked the shock and refused to complete test. A and B-Subject M. K. C - Subject T. M. D - Subject M. M. E - Subject Y. B. F - Subject H. D.

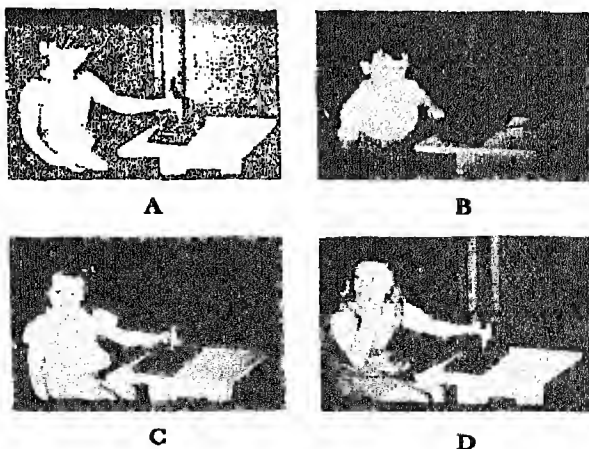


Figure 2.
Photographic illustrations for second trial of four children who refused to complete Series I. A - Subject Z. J. B - Subject H. K. C - Subject S. A. D - Subject K. N.

There were seven, four boys and three girls, who completed the task without giving evidence of emotion other than interest. Three children were excited by the shock and did not continue. One of these objected first to the bell. Five others were upset by the sound, some showing marked emotion and failing to continue.

A week later the test was repeated for three who were most disturbed without success in reducing the fear. Three who were not emotional on the first test again completed the task and two of these engaged in experimentation with the performance.

SERIES II

Since both bell and shock elicited responses that we may term fear reactions in some children in Series I, the bell alone was employed in Series II. An investigation of the child's method in solution of a problem was undertaken by Elisabeth Mast with these same children. It was arranged to have the same bell as employed in Series I wired in series with the stylus used to open the box and the spring on the box. A glass covered box contained a colored rubber toy which the child could obtain by making the lid fly open. The only method of opening was to push the point of the stylus through a small hole far enough to release a spring. The box is illustrated in Figure 3. As the opening was surrounded with brass it was possible to have the bell sound continuously after contact of stylus in the hole until the spring was released.



Figure 3

The records for Series II show that ten of 22 children manifested no fear nor dislike for the bell. Among these was the youngest subject, a girl 29 months old, and five children under 38 months of age. Five children showing dislike or startle at sound of bell continued trying to open the box. Some did not solve the problem on the first trial but were willing to return until they were successful. This required as many as five periods for some and in a few cases startle or verbal responses indicated continued dislike of the bell. After success there was often an eagerness to try again for a toy.

SERIES II

OPENING THE BOX WITH BELL RINGING

Subjects	Age in months	Sex	Trials	Remarks
W. E.	29	Girl	1	Jumped when bell rang but kept stylus in with continued ringing until box opened.
			2	Succeeded in two seconds. Then demonstrated how to do it.
T. B.	35	Boy	1	Rang bell frequently, said "I want the doll." Succeeded.
			2	Put stylus in hole immediately, succeeded in 35 seconds.
Y. B.	35	Boy	1	Rang bell continuously until box opened.
			2	Put stylus in hole immediately, succeeded in 21 seconds.

SERIES II - Continued

OPENING THE BOX WITH BELL RINGING

Subjects	Age in months	Sex	Trials	Remarks
J. F.	37	Girl	1	Rang bell immediately, said "It's just like Miss Johnson's."
			2	Said "I won't ring the bell will I?" Pushed stylus in, talking all the while.
			3	"I'm going to open the box today." "Put it in the little hole, I guess but the bell rings if I try it." Laughed.
M. M.	35	Girl	1	When bell sounded said "I can't, I don't want the noise." B.J. held her hand as bell rang, then told her to try, said, I can't. Finally opened the box.
			2	Said "I want you to do it for me." Was urged to show how to do it and succeeded in 4 seconds.
S. A.	35	Girl	1	Startled at first ringing, then wanted to continue ringing.
			2	Said "May I ring?" Jumped each time bell rang, talked throughout trial.
			3	"When I make noise, it comes open." Rang bell several times. Refused to continue. Said she would do it another day. Failed to get toy on each trial.
H. D.	35	Boy	1	After opening box demonstrated how to do it.
			2	Took a long time, no objection to bell.
L. M.	36	Girl	1	Kept bell ringing continuously without indications of dislike for it.
			2	Put stylus in hole immediately. Opened box immediately.
S. F.	51	Boy	1	Kept stylus in hole, ringing continuously until success.
			2	Succeeded in two minutes, 25 seconds.
Z. J.	45	Boy	1	Put stylus in hole. Said "I don't want to, I don't like that noise." Refused to continue.
			2	Said "I'm going to get the truck this time." Opened box in 6 seconds.
			3	Succeeded in 2 seconds.
L. H.	47	Boy	1	Said "I don't know how, you do it." Put stylus down and said "I can't." Took stylus again but would not touch box.

SERIES II - Continued

Subjects	Age in months	Sex	Trials	Remarks
L. H. (concluded)	47	Boy	2	Startled by bell. Rang bell off and on for five minutes. Seemed embarrassed. Said "It's a hard job for me to get the box opened."
			3	Put stylus in hole, causing sound, but withdrew immediately. Tried again with bell ringing but would not push through.
			4	Jumped when bell rang, tried again until successful.
			5	Succeeded in 4 seconds.
M. B.	36	Boy	1	Rang bell. Did not like it, said "It hurt." Refused to try again. Said "Tomorrow." Was brought to room later same day, shown how to open box and permitted to have a toy as he was leaving school that day. Went away very happy.
T. M.	43	Girl	1	Said "I don't like that noise," but put stylus in hole.
			2	Asked questions about bells, and lights, but put stylus in and was successful in less than 2 minutes.
			3	Succeeded in 3 minutes. No objection to bell.
H. K.	36	Boy	1	When bell rang, said "I think I will have to go out now." Continued but when stylus was held on plate and bell rang, did not move it towards hole.
			2	Touched plate, asked "Has Miss Johnson gone home? That big noise scares me to death." Kept trying but would not push stylus through after ringing. Did not want to leave without toy and was told he could come back another day.
			3	Put stylus on plate immediately. Continued until he succeeded. Was elated over getting toy.
K. J.	30	Boy	1	Touched plate immediately ringing bell. Dropped stylus, picked up and rang again, said "It hurts my ears; I want to get doll." Tried again.
			2	Rang bell continuously for more than 3 minutes until box opened.
			3	Succeeded in 9 seconds.
B. D.	64	Girl	1	Startled when bell rang, would not touch plate again.
			2	Asked to have box opened for her. Finally tried, said "Oh!" as bell rang but pushed and succeeded.
			3	After 1 minute 30 seconds, tried. Startled at bell. Jumped each time bell rang. Did not succeed because stylus was withdrawn when bell rang.

SERIES II - Concluded

OPENING THE BOX WITH BELL RINGING

Subjects	Age in months	Sex	Trials	Remarks
B. D. (concluded)	64	Girl	4	Started to put stylus but hesitated. Jumped at bell. Wanted to try again. On success said "I got it."
W. G.	46	Girl	1	When bell rang, said "No more." After refusal to try was shown where to put stylus. Then pushed it in and opened the box.
			2	Said "It hurts me." Trembled but tried with success. Then demonstrated, saying "You put it in here."
H. L.	47	Girl	1	Did not want to come in room. Finally persuaded to sit down before box. Rang bell after 4 seconds, then ran out of the room. Said later she wanted toy in box.
			2	Went to room but quickly withdrew. Would not enter. Said she would do it tomorrow.
			3	Tried to get her in room again but failed.
K. N.	68	Girl	1	Would not take stylus in hand. Finally permitted to go.
			2	Startled by bell. When urged to try again asked "Is it going to ring?" Would not touch plate again.
			3	Did not want to try. B.J. held her hand on stylus and pushed into opening. Did not like bell but continued pushing after hand was released.
			4	Put stylus in hole, kept trying until success. Said "It's funny, isn't it?"
S. C.	62	Boy	1	Succeeded in 2 seconds, no objections to bell.
T. J.	62	Girl	1	Running questions as to how to open box. Required five minutes.
			2	Succeeded in four seconds.
M. K.	69	Boy	1	Succeeded in 2 seconds.

Seven children manifested much more emotion. Success in the case of W.G. was attained after evident emotion was shown when bell first rang. This was probably due in great part to association of bell with shock in Series I when she was greatly disturbed. The record of H.L. who was the only one who refused to try at each period is similar to that for Series I. She appeared to be distressed by the sound. The variations in emotional behavior are not explained by age or sex differences.

SERIES III

Interest in obtaining the toy in Series II had minimized the effects of the sound and in Series III only the electric shock was introduced as an annoying situation. The same tracing board and shock apparatus as employed in Series I

was presented. Instead of tracing the path the child was asked to push balls into a basket with the stylus. A steel ball bearing was placed in the path four sections from the end and the child was told that if he pushed it into a basket he could have it. A wastepaper basket on the floor would catch a ball when it was pushed off the end of the board. When the stylus touched the ball a shock was received. The shocks were more continuous in this series and the task more difficult as the ball was pushed about the turns. If the ball was early pushed off the board in such way that it rolled onto the floor the child could not have the ball. After the first success a child was given an opportunity to get a second ball. Only two balls were permitted to a child. If he did not want to try for a second ball he was not urged to do so. The results for Series III show the large number obtaining two balls.

SERIES III

STEEL BALL BEARINGS AS GOAL. ONLY TWO BALLS PERMITTED TO A CHILD.

Subject	Age in months	Sex	Balls obtained	Remarks
W. E.	29	Girl	2	
T. B.	35	Boy	2	
Y. B.	35	Boy	2	Stopped 3 times on receiving shock. Started to push with hand. Again took stylus and obtained ball.
J. P.	37	Girl	2	
M. M.	35	Girl	1	Refused to try again.
S. A.	35	Girl	1	Refused to try again.
H. D.	35	Boy	2	
B. J.	36	Girl	1	Refused to try for second ball.
L. M.	36	Girl	2	
S. F.	51	Boy	2	Cautious at first, slow but persisted.
Z. J.	45	Boy	2	
L. H.	47	Boy	2	
T. J.	62	Girl	2	Lifted stylus from ball as though amazed. Continued with light touches.
M. K.	69	Boy	2	
K. N.	68	Girl	2	
B. D.	64	Girl	2	
H. L.	47	Girl	2	When first asked to go down refused. Said, "Do not want your game." After several had returned to the class room was asked again. On refusal was told she need not play game but must go down. Cried but was taken down and allowed to sit at a distance and observe. Finally walked near board to watch but refused to try and went back to room. Later asked to come down and watch another child, but again declined to try saying she would do it tomorrow. An hour later was sent a message that she could come down and get the balls if she wished as there would be no balls for her tomorrow. Came down stairs alone, approached board cautiously, slowly lifted stylus and pushed ball. Greatly pleased to obtain one. Repeated performance obtaining second ball and went away laughing aloud and calling "I got two balls."

Children who were wary and appeared somewhat distressed on completion of Series I were much quicker in response to Series III. In several cases the stylus was dropped after contact with the ball and in other cases attempts were made to change it to the other hand. All children tested in Series III went through the test and left the room very happy. All except three obtained two balls. One child H. L. required unusual tactics as described in her record for Series III and one other, W. G. was not even urged to come down to the experimental room. The reason in the latter case was that she was so upset in Series I it was difficult to get her into Series II. With final success in that she was seemingly over her fear responses to the room and to the experimenters. On the last day of school we did not consider it wise to risk another upset. In no case did we end the study with the child unhappy over the experiences.

The results for the three series show that there are marked variations among children in responses to situations that may be termed annoying or fear-provoking. This variability is not directly related to age or sex for this group. Both tracing the path and opening the box might be assumed to be more difficult for the younger children hence prolonging the unpleasant situation. The tendencies manifested by the children who appeared most fearful are similar to the everyday behavior of these children in situations that offer difficulty or uncertainty as to what to do. Some tend to attack such situations with caution or timidity but slowly enter into it and work toward success. Others tend to withdraw, solicit others to do for them, and watch on the side lines. Of the group of six who were most apprehensive in Series I and II and timid or withdrawing in initial attack upon Series III, some are assertive in social contacts with those whom they know or in familiar situations. Only close observation over a period of time would show their tendencies to approach a new or difficult situation with a fearful attitude.

The motivating factor in the child's response to a situation presented to him for the first time is often difficult to recognize. Distracting the child's attention from the novelty or difficulty and the slow process of associating a pleasing object or act with the unpleasing or feared object does not seem the most promising method of motivation. The child's perception of the situation and the end toward which he directs his activities are most important for understanding his behavior and for aiding him to overcome difficulties in individual and social adjustments. In the most difficult situation, Series I, with no reward other than success in completing a suggested task some were eager to succeed. Attention was given to the performance; sound or shock were seemingly neglected. The reward, if the steel ball bearings are so considered, was apparently effective in reducing attention to the shock. This reward was not something to be attained at the completion of the task but formed an essential part of the response activity. The activity of pushing the ball, of obtaining it for himself appeared highly motivating. For those who obtained only one ball the response was too unpleasant or not sufficiently interesting to make the ball a potent reward.

We cannot ignore the tendencies of the child to seek the pleasant or to avoid the unpleasant yet we often wonder why a child finds some acts pleasant and others unpleasant. It does appear that in situations in which a child directs his own activities toward a recognized goal, attention and resistance to the difficult or unpleasant elements are decreased. If the goal is a major part of the response pattern success is attained by a larger number than when the goal is an unrelated reward for completion of the task.

AN ANALYTICAL STUDY OF CHILD LEARNING

VIRGINIA L. NELSON¹

In the field of learning, experiments with young children offer most promising opportunities. It is a question whether the so-called rational learning test differs greatly in the principles involved from other types variously called motor skill or formation of associations or solution of problems.

In 1918, Peterson (4) published results from a group of learning experiments about which he says, "A sort of choice-reaction problem is presented to the human subject, about whose rational ability there is no doubt. It is our purpose to see how rational learning is related to learning that must depend wholly on 'trial and error' efforts. How effectively are ideas used in a type of learning in which their employment is obviously helpful?" The experiments in question and results of later investigators who have used Peterson's test will be discussed here as being similar to the learning problems in the present investigation. None of the subjects so far have been young children, the studies have been made with college students, with disabled soldiers, and in comparative studies of negroes and whites. In the Rational Learning Test, as devised by Peterson (4) in 1917, the numbers one to eight inclusive were assigned in random order to the first eight letters of the alphabet. The reactions required of the subject were to associate each of these numbers with the letter assigned to it. This was to be done, according to the author, by means of a series of guesses, the range of which might be greatly limited by the use of a rational organization of the situation. Each subject completed the learning at a single sitting, the learning being completed when the subject had given the whole series twice without error. Record was kept of time, repetitions, and errors. There are three classes of errors: unclassified errors, all responses made except the correct ones; logical errors, numbers which have already been used for earlier letters of the series; and perseverative errors, numbers already guessed wrongly for the letter in question. The test is of such nature as to admit of several forms of different grades of difficulty according to the numbers of letters used.

Various forms of the Rational Learning Tests have been used extensively by Peterson and his students, particularly in a series of studies of the comparative abilities of negroes and whites (5) (6) (7) (8). It is interesting to note that they found the negroes to be relatively stronger in retention than in rational organization when compared with the whites.

Heron (3) conducted a study in which he used five stylus mazes of slightly different patterns and two forms of the Rational Learning Test, a ten-letter and a fifteen-letter form. Results indicated that there was practically no relationship between the learning of the maze and rational learning. Also, there was found a fairly high degree of relationship between the scores in the two Rational Learning Tests.

Haught (2) in an investigation of the interrelation of some learning processes with eighty college students used two forms of the Rational Learning Test, the ten-letter form and one which he called "Rational Learning (Modified)." Apparatus similar to that used in the last named test has been employed in the present investigation of the learning of young children and will be described in detail later. It consisted of a board through which were put bolts arranged in rows. One bolt in each row was connected in an electric circuit so that a bell would ring when the correct bolt was touched by a stylus which was also a part of the electric circuit. Records like those originally devised by Peterson were kept. Correlations and inter-correlations were calculated and it was found that for the Rational Learning Test repetitions and perseverative errors were the significant factors, that is, contained everything that was common to the other factors. For Rational Learning (Modified) time and unclassified errors were the significant factors. Garrison (5) later under somewhat different conditions, with the eight-letter form of the test, found time and logical errors to be the most important and reliable factors, when correlated with intelligence. Both Haught and Garrison found positive correlations between intelligence and the different test factors

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with the exception of perseverative errors, which were not found to be statistically reliable by Garrison.

PROBLEM

The need of further study and analysis of the learning of young children under experimental conditions has prompted this investigation wherein was presented to the child a learning problem, the completion of which depended more on the use of ideas than on the development of a comparatively high degree of motor skill.

The investigation consisted of three experiments in each one of which different groups of children were subjects. In some instances, however, a child who had not completed one experiment was used in a later one.

Subjects.

The subjects in this study were sixty-seven children enrolled in the Child Institute of the Johns Hopkins University with a chronological age range of 2 years 4 months to 5 years 4 months and an Intelligence Quotient range of 96 to 168. The chronological ages were reckoned at the beginning of each learning problem. The Intelligence Quotients were derived from the Stanford Revision of the Binet-Simon tests, which were available for all subjects. These intelligence tests were given as a part of the Child Institute routine and, with five exceptions, had all been given within four months of the time each learning experiment began.

Apparatus and Procedure.

Apparatus which has been built in the Psychology Laboratory of the Johns Hopkins University according to Haught's (2) description of his Rational Learning board was used in all three experiments in this investigation.

This description is given below:

"The apparatus consists of a board about twenty inches square through which are put one hundred bolts arranged in ten rows with ten bolts in a row. The rows are lettered from A to J and the bolts in each row are numbered 1 to 10. One bolt, and only one, in each row is connected in a circuit with an electric bell so that when the bolt is touched with a stylus the bell will ring."

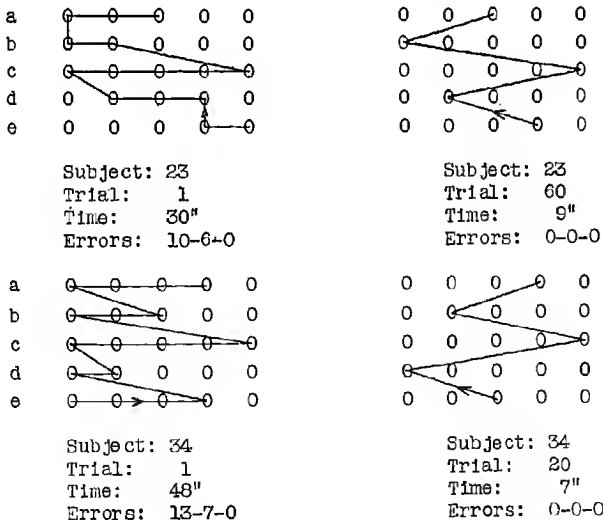
In the diagram of the apparatus that follows each O represents a bolt. The letters A to J and the numbers 1 to 10 were pasted underneath the sides of the board and were not visible to the child during the experiment

J	O	O	O	O	O	O	O	O	O	O
I	O	O	O	O	O	O	O	O	O	O
H	O	O	O	O	O	O	O	O	O	O
G	O	O	O	O	O	O	O	O	O	O
F	O	O	O	O	O	O	O	O	O	O
E	O	O	O	O	O	O	O	O	O	O
D	O	O	O	O	O	O	O	O	O	O
C	O	O	O	O	O	O	O	O	O	O
B	O	O	O	O	O	O	O	O	O	O
A	O	O	O	O	O	O	O	O	O	O
	1	2	3	4	5	6	7	8	9	10

The above description applies to the Learning board used in all three experiments. The whole board was used in the preliminary experiment and on the basis of the results obtained it was decided to use only a part of the board for the

later experiments. The board was too large for the children to reach with ease and also required a longer period for a trial than children of this age will usually attend or cooperate. One-fourth of the board was used for the later series. Thus the learning in experiments II and III was concerned with five rows of bolts, five in a row, one bolt in each row so connected in a circuit with an electric bell that when the bolt was touched with a stylus the bell would ring. The original board was covered with black cloth, with the exception of the lower left quarter of the board. The learning board was firmly attached to a table whose top was slightly tilted in order to make it comfortable for the child to reach all of the bolts easily and to give him the best possible view of the whole top of the board. The stylus with which the bolts were touched was six inches long and was of light weight, the metal core being covered with a handle of hard rubber and the part grasped by the child one-half inch in diameter. This proved to be satisfactory for all subjects with the possible exception of the two-year olds. Fatigue expressed by two of them may have been partly due to this source.

The experiments were all conducted with only the subject and the experimenter present in the room. The procedure in general was the same for all experiments. The child came into the room to play a "game," which soon became known as the "ring the bell game." The child always stood in front of the board with Row A nearest him. The experimenter was seated behind him and slightly to the right. In this way the experimenter had a full view of the subject's performance and could record all responses as made. The child always began a trial with the stylus held in his right hand. Time was kept with a stop watch. Record of each bolt touched by the subject was kept. In the preliminary experiment Peterson's (4) method was followed, the experimenter writing down the number of the particular bolt touched. In Experiments II and III mimeographed record sheets like the diagram of apparatus were used. The experimenter drew a continuous penciled line on the record sheet, which indicated each bolt touched by the subject and the order in which it was touched. Figure 1 gives a replica of the record of the first and last trials of one of the subjects who completed Experiment II and one who completed Experiment III.



EXPERIMENT I

In the preliminary experiment in this investigation the Haught Rational Learning board was employed. The board was arranged for schedule 1: A-6, B-4, C-8, D-1, E-8, F-10, G-3, H-2, I-7, J-5 as described by Peterson (4). This means that when bolt 6 in row A, bolt 4 in row B, etc. were touched with the stylus the bell would ring. When a non-ringing bolt was touched, that is, all bolts except those enumerated above, it constituted an error. In this investigation Peterson's (4) classification of errors was considered as follows: 1. unclassified errors, those errors which consisted in touching any bell that did not ring; 2. logical errors, errors which consisted in touching a bolt that had already been used for an earlier letter in the series; 3. perseverative errors, errors which consisted in repeating a wrong response.

Eight children, 4 years of age, took part in the preliminary experiment. It was decided to use the same instructions in this form of learning as was used with adults. On the basis of the results modification of procedure in later forms was made. The child came into the room with the experimenter to play a "game" and was shown the board covered with a cloth. As the child stood in front of the board the experimenter removed the cloth and said "You see this board. It has ten rows of bolts, ten bolts in each row. One bolt in each row and only one will ring a bell when you touch it with this stylus. (The experimenter showed the stylus which she held in her hand and continued). In each row a different bolt rings. The game is to begin with the bottom row and find the bolt that rings the bell. As soon as the bell rings go up to the next row and find the bolt that rings. Keep on up to the top row and find all the bolts that ring. Remember (pause) begin at the bottom row and as soon as the bell rings find the next bell. The game is to find all the bolts that ring just as quickly as you can." The experimenter laid the stylus down on the board and as the child picked it up said, "Begin with the bottom row. Now, go ahead."

When the trial was completed the experimenter said, "Let's play the game again. Remember, begin with the bottom row and find all the bells. As soon as the bell rings go up to the next row." Three trials were given in one sitting.

A sitting of four repetitions was tried out with the first subject taken, a boy who was most cooperative. He required 455 seconds to complete the sitting, the time of the repetitions being 105, 112, 98 and 140 seconds respectively. This was too long a sitting for children of the ages under consideration so it was decided to have each sitting consist of three repetitions. A total of 121 repetitions was secured from the eight subjects before the close of the school year on which terminated this preliminary experiment.

In table 1 the total number of repetitions, total time and total errors for each subject are given. As this was undertaken as a preliminary experiment, the subjects were given opportunity to continue the problem until the close of the school term. Absences account for the irregular number of repetitions for each subject.

A study of the results obtained from this exploratory experiment revealed certain trends which seemed suggestive despite the extreme difficulty of the board and the small number of children concerned. A decrease in average time and errors was noted when the averages of the earlier trials were compared with the averages of the later trials. (See figures 2 and 3). Certain bolts were learned more quickly as to their position on the board. The first and last bolts in a row, D-1 and F-10, were found without error the greatest number of times. (See figure 4). The ringing bolts in the bottom and top rows, A-6 and J-5, came next in the order of times found. The tendency of some of these children to begin each row at the extreme right or the extreme left of the board may somewhat explain the greater number of successes for D-1 and F-10. Three of the children began with the first bolt in a row more than 50% of the time and two began with the last

bolt in a row over 50% of the time. Individual differences were marked for amount of time required per trial and for the number of perseverative responses. For total number of errors and for logical errors the individual variations were small. There were wide variations from day to day for individual children.

TABLE 1

Scores for individual subjects in rational learning.

CA chronological age in years and months at beginning of experiment; IQ Stanford-Binet Intelligence Quotient; UC unclassified errors; (L) logical errors; (P) perseverative errors; DNC "did not complete."

Subject	CA	IQ	Sittings	Trials	Time	Errors			
						UC	L	P	
1	3-11	104	3	10	1391	496	256	54	DNC
2	3-11	108	1	3	453	146	76	16	DNC
3	4-4	115	5	15	1451	673	329	10	DNC
4	4-5	128	5	15	2011	730	359	29	DNC
5	5-0	129	7	21	2347	963	528	21	DNC
6	5-3	101	8	24	2757	966	521	31	DNC
7	5-3	133	8	24	4331	1113	518	138	DNC
8	5-4	137	3	9	807	387	194	6	DNC
Total			40	121	15548	5474	2781	325	
Average per trial					128.45	45.45	22.9	2.7	

EXPERIMENT II

The inadequacy of the entire Haught Board for the study of learning of children as young as this group led to use of only a portion of the original board in the second and third series. One-fourth of the Haught Board gave a pattern of five ringing bolts from a total of twenty-five instead of a pattern of ten ringing bolts from a total of one hundred. This proved to be a difficult enough pattern for children of these ages.

Twenty-four children between three years and five years, four months old took part in the experiment. The method used was a three minute work limit with an interval of one week between sittings. All children were allowed to complete the trial in process when the three minute working time was up but no new trial was begun within five seconds of the end of the three minutes. Two somewhat different methods of attack were used in this work limit experiment, which will be described as Form A and Form B. The schedule of ringing bolts for both Forms A and B was the same as illustrated in figure 4. No ringing bolt was directly over or under the ringing one in the adjoining row nor was it adjacent to the ringing one.

The board was mounted as in the preliminary experiment. The child and the experimenter were also in the same relative positions. The child stood in front of the board with the experimenter seated behind him and slightly to the right with stop watch and stenciled record blank out of the range of vision of the child.

At the first sitting the following directions were given to each of the eighteen children in Form A. "You see this board. Here are some rows of bolts the same number in a row. (The experimenter ran her hand along the five rows). One bolt in each row rings a bell when you touch it with this stylus. (Here the experimenter showed the stylus which she held and touched the ringing bolt in the third row). Only one bolt in each row will ring. The game is to begin with the bottom row and find the bolt that rings the bell. As soon as the bell rings, go up

to the next row and find the bolt that rings. Keep on up to the top row finding the bolt in each row that rings. I want you to learn so that you will touch only the bolt that rings. Begin with the bottom row here. (Pointing toward bottom of board.) Now, go ahead."

If the child hesitated too long at any time he was urged to go on. When one trial was completed the experimenter said: "Now, let's play the game again. Ready, go."

At the second sitting one week later the directions to the child were shortened. When he was standing in front of the board and the cover had been removed the experimenter put the stylus in the child's hand holding it as she said, "You know what you did before, you began with the bottom row and touched the bolt in each row that rings. Remember you want to learn so you will touch only the bolt that rings. Ready, Go." As before if the child hesitated too long or stopped he was told to, "Go on and find the bell." When one trial was completed he was again told, "Now let's play the game again. Ready, Go," until three minutes' time was up.

Form B. In the course of the experiment it seemed to be of interest to know how children might attack a problem of this kind when left more to their own devices. A few children were tried in learning Form B which was similar to Form A except that the children were allowed to begin to touch the bolts on any row. They were told that, "only some of the bolts ring" instead of being told that only one in each row would ring.

Table 2 gives the total scores for trials, time in seconds, and classified errors for each child. The general intelligence of the children as shown by the Stanford Revision of the Binet-Simon Scale was distinctly above normal with the exception of a few cases. A total of 591 separate repetitions was made by the 18 children. The average time for the group for the 591 repetitions was 26.5 seconds, the average number of errors was 8.7.

Table 3 gives the distribution of errors for each subject for Forms A and B arranged according to the row in which they occurred. The fewest number of unclassified errors occurred in Row d where the first bolt was the ringing one while the greatest number of unclassified errors occurred in Row c where the fifth or last bolt was the ringing one. This bolt was the one demonstrated by the experimenter. The rows ranked according to the smaller number of unclassified errors were d with 1143 errors, a with 1243 errors, e with 1289 errors, b with 1481 errors and c with 1768 errors.

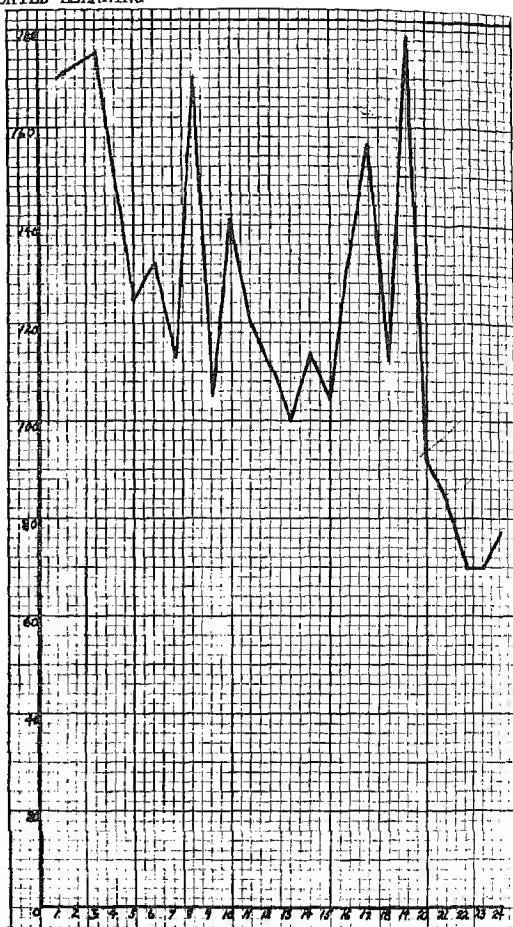


Figure 2

Mean time required by the group for each trial

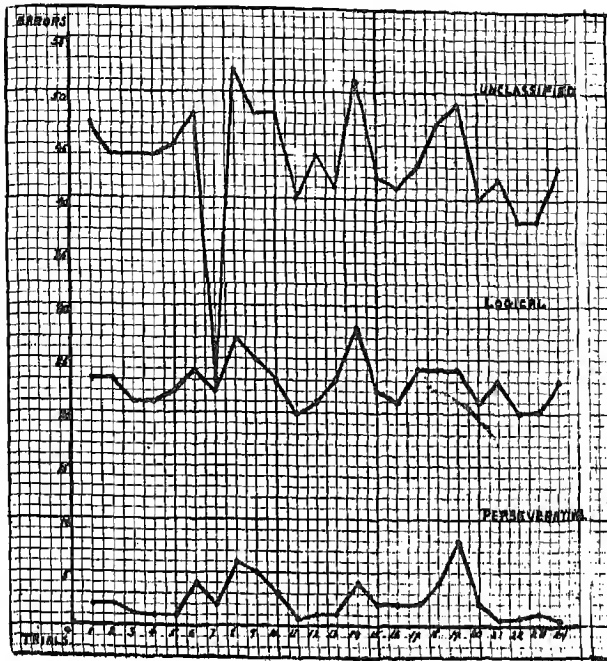


Figure 3
Mean score for errors made by group on each trial

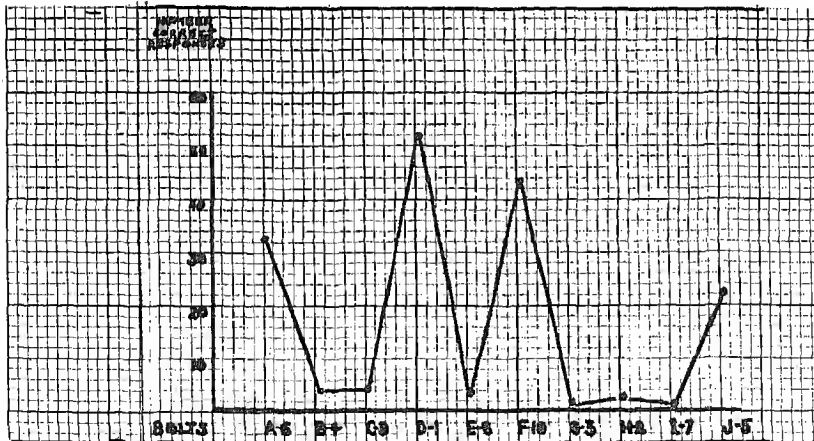


Figure 4
The total number of correct responses by all eight subjects in Experiment I, for the ringing bolt in the respective rows.

TABLE 2

Distribution of repetitions, time in seconds and classified errors in Learning II A and B. CA chronological age in years and months; IQ intelligence quotient; UC unclassified errors; (L) logical errors; (P) perseverative errors; DNC did not complete.

II FORM A

Subject	CA	IQ	Sit- tings	Trials	Time	Errors			
						UC	L	P	
1	3-0	127	3	9	555	112	68	6	DNC
2	3-2	121	5	14	894	227	109	11	DNC
3	3-5	116	6	28	1086	313	138	25	DNC
4	3-5	130	3	13	540	200	109	9	DNC
5	3-6	135	4	25	724	209	102	14	DNC
6	3-6	120	7	53	1264	514	269	36	DNC
7	3-8	141	6	34	1100	344	205	0	DNC
8	3-11	116	6	49	1081	328	126	7	DNC
9	4-0	149	6	53	1122	275	156	13	
10	4-2	113	3	9	558	106	53	11	DNC
11	4-6	132	6	60	1080	325	136	7	
12	4-8	135	3	21	518	145	67	1	
13	4-9	133	4	27	632	260	108	6	
14	4-10	115	2	3	366	40	21	5	DNC
15	4-11	133	3	24	547	187	76	8	DNC
16	4-10	104	5	56	844	411	239	8	
17	4-11	104	9	50	1334	441	252	7	DNC
18	5-2	115	8	63	1440	697	276	45	DNC
Total			89	591	15676	5134	2508	219	
Average					26.5	8.7	3.5	.4	

FORM B

19	3-7	116	4	7	719	148	73	59	DNC
20	3-10	105	5	25	896	643	349	178	DNC
21	4-4	117	2	2	360	63	30	29	DNC
22	4-4	132	5	15	836	93	47	31	
23	4-11	115	2	9	363	132	57	32	DNC
24	5-4	111	5	41	906	711	330	83	DNC
Total			23	99	4080	1790	886	412	
Average					41.2	18.1	7.9	4.2	

The number of times the ringing bolts were found without errors is given in table 4. d-1 again has the first rank with a score of 372. The other bolts in order of time found are respectively c-5, a-4, e-3 and b-2. The number of errors within a single row is determined in part by the order of striking the bolts. Since the children varied widely in methods of finding the ringing bolt these individual differences explain in great part the frequency of errors for particular rows of bolts. It is clear for this group that the first and last bolts in a row are found without error, that is, they are learned more quickly than other bolts.

TABLE 3

Distribution of classified errors for each subject for each row in Learning II, Forms A and B

Subject	Trials	ROWS														
		a			b			c			d			e		
		UC	L	P	UC	L	P	UC	L	P	UC	L	P	UC	L	P
1	9	10	0	1	21	8	1	32	20	2	31	22	1	18	18	1
2	14	43	0	0	54	13	5	44	22	4	45	33	1	41	41	1
3	28	73	0	1	50	10	6	114	57	17	19	14	0	57	57	1
4	13	37	0	0	38	11	1	29	16	2	56	42	4	40	40	2
5	25	25	0	0	57	18	7	80	42	6	19	14	0	28	28	1
6	53	76	0	7	72	12	4	203	105	16	56	43	6	107	107	3
7	7	22	0	6	30	3	11	37	19	15	25	19	12	34	34	15
8	34	35	0	0	104	34	0	1	1	0	136	102	0	68	68	0
9	25	100	0	15	117	29	28	142	70	46	147	113	48	137	137	41
10	49	85	0	2	64	10	3	119	58	0	7	5	0	53	53	2
11	53	10	0	0	114	41	7	62	33	2	34	27	2	55	55	2
12	9	18	0	1	24	7	5	19	9	1	25	17	2	20	20	2
13	2	13	0	6	6	1	2	16	5	2	14	10	7	14	14	6
14	15	17	0	6	20	3	5	16	6	5	15	14	5	25	25	10
15	60	55	0	0	82	20	2	121	59	5	30	20	0	37	37	0
16	21	27	0	0	29	3	1	35	12	0	8	6	0	46	46	0
17	27	76	0	3	25	1	0	99	49	3	10	8	0	50	50	0
18	3	7	0	0	9	3	2	10	5	2	7	6	1	7	7	0
19	24	40	0	3	40	8	2	73	39	0	16	11	3	18	18	0
20	56	40	0	0	132	42	0	13	7	0	144	108	4	82	82	4
21	9	33	0	8	28	6	6	30	14	8	19	15	4	22	22	6
22	50	52	0	2	123	39	3	32	17	2	152	114	0	82	82	0
23	63	195	0	10	101	12	18	264	131	13	14	10	2	123	123	2
24	41	154	0	19	141	32	27	177	88	13	114	85	17	125	125	7
Total	690	1243	0	90	1481	366	146	1768	884	164	1143	858	119	1289	1289	106

Table 2 gives a distribution of the six children who worked by the trial and error method of approach, Form B. A study of the table will show for the six children a total score of 4080 seconds in time, of 1790 unclassified errors, of 886 logical errors and 412 perseverative errors. The corresponding average scores for the group based on the 99 repetitions made were respectively 41.2 seconds, 18.1 unclassified errors, 7.9 logical errors and 4.2 perseverative errors. In comparison with the scores for Form A the time per repetition for this group was one and a half times as long; there were twice as many unclassified and logical errors in a repetition and more than eight times as many perseverative errors.

However in a group as small as this individual differences may largely account for this seeming difference. The larger average times taken is partly accounted for in that a repetition was not completed until all the ringing bolts were found and sometimes a child would keep touching the ringing bolts found without trying to find all of them. One of the six, subject 22, a four year old boy, completed the learning. His record is included with the five completing Form A.

The reductions in time for successive repetitions for all children in II Forms A and B are clearly shown by the average scores for each repetition which are given in table 5. The average time for the first repetition was 76.4 seconds; for the 60th trial 19.5 seconds. The reduction in errors with successive trials are also given in this table. The variability in decrease is to be explained by the dropping out of those children who completed the learning. Figure 5 shows these same reductions at intervals of ten repetitions.

TABLE 4

Distribution of number of correct responses for each subject in each row Forms A and B. a-6, etc. refer to the letter of row on board and position in row of ringed bolts.

Subject	Trials	Number of correct responses					Total	Per cent correct
		a-4	b-2	c-5	d-1	e-3		
1	9	2	0	0	0	0	2	4.4
2	14	0	1	1	2	0	4	5.7
3	28	2	0	3	23	0	28	20.0
4	13	0	1	4	0	0	5	.7
5	25	14	2	3	13	7	39	31.2
6	53	19	10	5	36	2	72	27.1
7	7	0	0	0	0	0	0	0
8	34	0	0	33	0	0	33	19.4
9	25	0	0	0	0	0	0	0
10	49	17	11	11	46	25	110	44.9
11	53	43	9	26	41	24	143	53.5
12	9	2	1	1	0	1	5	11.1
13	2	0	0	0	0	0	0	0
14	15	11	5	8	9	8	41	54.6
15	60	37	11	26	46	40	160	53.3
16	21	10	4	4	19	6	43	40.9
17	27	3	3	3	8	3	20	14.8
18	3	0	0	1	0	1	2	13.3
19	24	5	3	0	19	12	39	32.5
20	56	20	7	51	21	17	116	41.4
21	9	1	3	1	5	2	12	26.7
22	50	6	6	39	9	8	68	27.2
23	63	1	0	0	59	3	63	70.0
24	41	0	0	0	16	0	16	7.8
Total	690	193	77	220	372	159	1021	

In figure 6 the learning scores for time and unclassified errors of the six children who completed the learning, five in Form A and one in Form B are shown. A downward curve again appears for both time and errors, with the error score also showing an irregularity between the 30th and 40th repetitions. This irregularity may be partially explained by the effect of individual differences in so small a number of subjects.

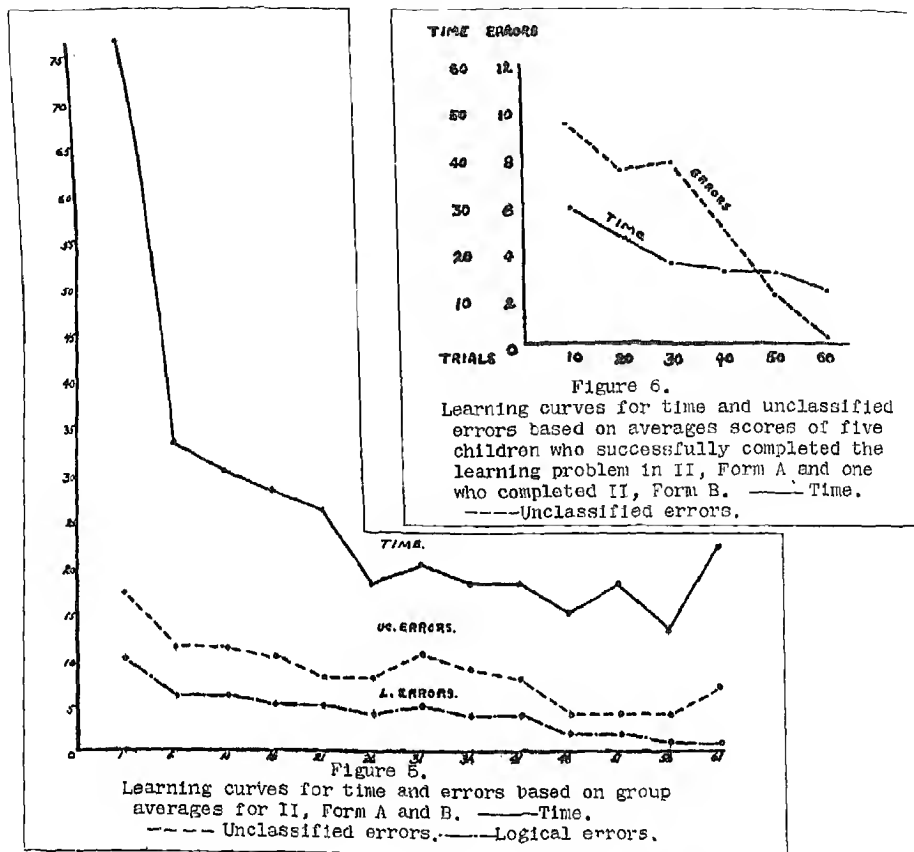
Figures 7 and 8 show individual learning curves of two of the subjects who successfully completed the learning. Both show a rapid decrease of both time and errors in the later repetitions.

Summary. Learning as shown by the decrease in time and errors was shown by all children taken individually, both by those who completed the learning successfully and also by those who did not quite complete it within the limits of the experiment.

TABLE 5

Distribution of averages of time in seconds and classified errors for each repetition in II, Forms A and B.

Trials	Time	Errors		
		UC	L	P
1	76.4	17.2	9.7	4.0
2	55.9	13.9	7.2	2.0
3	50.7	15.3	7.6	2.1
4	46.4	14.4	7.0	1.7
5	34.7	12.8	6.5	1.2
6	33.4	11.4	5.9	.7
7	37.7	12.2	6.2	.7
8	36.4	10.2	5.4	1.0
9	29.4	10.7	5.2	1.2
10	28.8	10.5	4.9	.8
11	30.0	10.8	5.6	1.1
12	26.8	10.5	5.1	.3
13	29.7	11.4	5.6	.3
14	26.8	10.0	5.5	.2
15	21.7	8.7	4.4	.2
16	28.4	9.7	4.5	.9
17	26.0	10.8	5.4	1.6
18	23.5	8.8	4.1	.6
19	24.7	10.6	5.5	2.3
20	26.5	9.4	4.7	.3
21	25.7	8.1	4.1	.1
22	27.0	12.1	5.4	1.8
23	22.4	9.6	4.6	.3
24	22.6	9.9	5.0	.5
25	18.5	10.4	4.9	.9
26	18.4	8.4	3.9	.3
27	20.7	9.3	4.4	.5
28	22.6	9.7	4.7	.5
29	19.4	7.6	4.2	.1
30	20.4	9.6	4.7	.4
31	19.6	10.5	5.3	1.3
32	17.4	8.6	4.1	.1
33	23.3	8.0	3.9	0
34	19.0	8.4	4.1	0
35	15.4	7.5	4.1	.1
36	18.3	9.1	4.1	.8
37	20.1	9.4	4.8	.8
38	18.5	7.9	4.0	.6
39	20.6	8.6	4.0	1.3
40	19.9	7.6	3.5	0
41	17.6	7.5	3.5	.1
42	20.1	5.7	2.9	.2
43	16.0	6.7	2.9	.3
44	16.6	4.7	2.4	0
45	22.9	5.7	2.4	.5
46	15.3	4.4	1.9	1.0
47	14.7	3.3	1.4	0
48	15.7	3.5	1.4	0
49	20.0	4.9	2.4	0
50	15.8	4.3	1.7	0
51	17.6	4.4	1.8	0
52	15.2	4.0	1.6	0
53	16.4	4.6	1.8	.2
54	12.7	3.3	1.3	0
55	14.3	3.6	1.3	0
56	12.7	4.3	1.3	1.0
57	15.0	5.5	2.5	0
58	18.5	7.0	3.5	0
59	23.0	6.0	2.0	1.0
60	19.5	4.5	1.5	0
61	22.0	7.0	1.0	0
62	15.0	8.0	2.0	0
63	40.0	10.0	3.0	0



TIME ERRORS

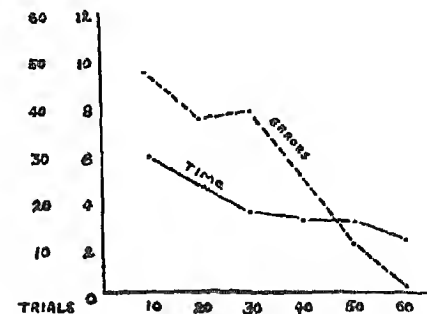


Figure 6.

Learning curves for time and unclassified errors based on averages scores of five children who successfully completed the learning problem in II, Form A and one who completed II, Form B. — Time. --- Unclassified errors.

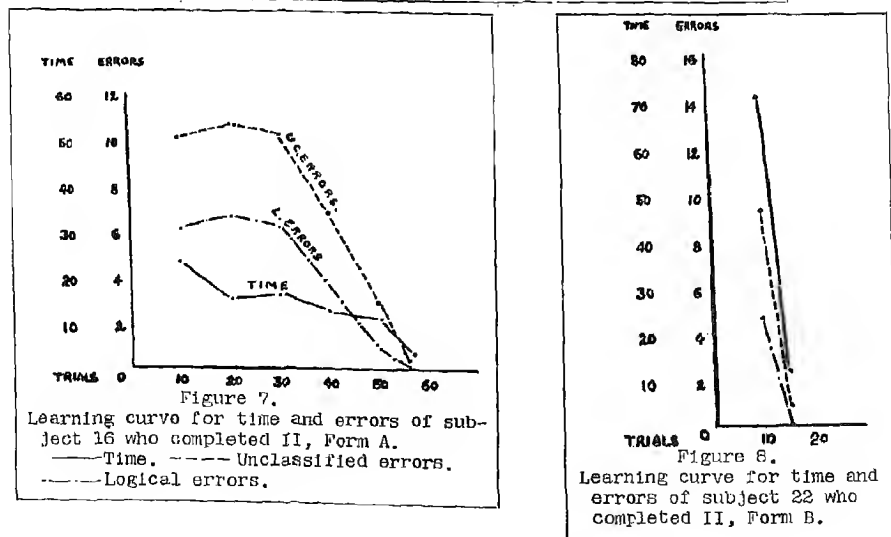


Figure 7.

Learning curve for time and errors of subject 16 who completed II, Form A.

— Time. --- Unclassified errors. . . . Logical errors.

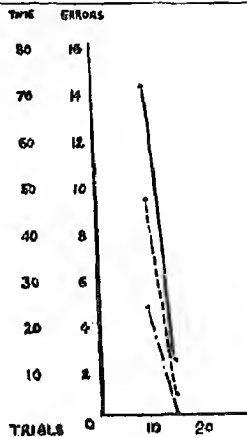


Figure 8.

Learning curve for time and errors of subject 22 who completed II, Form B.

EXPERIMENT III

The third and last experiment in this investigation differed in that a work limit rather than time limit was employed for each sitting. Otherwise the procedure was similar to that in I and II with the exception of a modification of the instructions. This group consisted of thirty-five children, twenty boys and fifteen girls, whose ages ranged from 2 years, 4 months, to 5 years, 2 months. The problem was new to all but five of the children.

Five trials were made in one sitting and the sittings occurred twice a week. A different schedule of ringing bolts was arranged so that bolts a-3, b-1, c-5, d-2 and e-4 made the pattern to be learned. These were the third bolt in Row A, the first bolt in Row B, the fifth bolt in Row C, the second bolt in Row D and the fourth bolt in Row E.

Directions to the child were further defined and the procedure was as follows: At the first trial the board was shown to the child as he stood in front of it with the 25 bolts exposed, then the experimenter began: "See these buttons. Some will make a bell ring when you touch them with this rod." The experimenter covered with cardboard all except the top row then said: "Watch me find the button that rings in this row," (beginning at the left and touching each button with the stylus until the fourth bell rang). "Here it is. This is the only one to ring in this row. If I touch the others they will not ring. See." As she touched the remaining one in that row she said: "Only one in this row rings, now you find it." The stylus was put in the child's hand and if he made a move to begin at the right he was told: "Wait, begin over here." If he moved to continue after finding the bell, the experimenter said: "Stop now. Only one bell in each row rings. Let's try another row." This time all rows except the middle one was covered and the child was told: "Find the bell that rings in this row." The same procedure was followed in having the child begin at the left and stop when he found the bell. The cardboard was then removed and pointing to the bottom row at the left the experimenter said: "Begin here and find the bell in each row that rings." No more instructions were given, except to say "Go and find the bell," if the child stopped, or to show him the next row, if he tended to go elsewhere. This was done only on the first trial. Record of the performance of the child was kept as in the preceding experiments.

The totals for repetitions, time and errors of the 35 children who took part in this third experiment are given in table 6. Here will also be seen the chronological age distribution and the intelligence quotients as found by the Stanford Revision of the Binet-Simon Scale. In this group three two-year-olds were available for trials at the problem and a larger number of three-year-olds for more trials than it was possible to obtain in the second experiment.

In table 7 is shown the distribution of errors for each subject according to rows. The bolts ranked according to fewness of errors are a-3, b-1, e-4, d-2, and c-5. Row c where the fifth and last bolt was the ringing one occupied the same rank as in the second experiment, while the middle bolt in the bottom row occupied the first rank. When the order of the ringing bolts is taken from table 8, they become in the order of times found respectively b-1, a-3, e-4, c-5, and d-2. Thus the first bolt in a row was found the greatest number of times and the second bolt in a row the fewest number of times whether this latter bolt was in Row b or in Row d as occurred in the two schedules used.

Individual Variations. Five of the children in this group had taken part in the second experiment one year before when they were three years old as indicated in table by r. In this third experiment three learned the problem successfully but two were unable to complete the problem. The younger children varied more widely as to method of procedure and tended to touch the bolts in columns as well as in rows.

TABLE 6

Distribution of subjects in Experiment III as to chronological age; intelligence quotient, trials, time in seconds and classified errors. (r) -- These children took part in II. DNC--did not complete.

Subject	CA	IQ	Sit- tings	Trials	Time	Errors			
						UC	L	P	
1	2-4	131	8	30	2303	353	188	37	DNC
2	2-7	131	4	15	1238	178	83	22	DNC
3	2-8	168	17	85	3155	880	436	58	DNC
4	3-0	137	12	60	1974	787	440	28	DNC
5	3-4	130	7	35	899	367	216	9	DNC
6	3-7	114	4	13	1082	159	76	18	DNC
7	3-7	128	17	85	2832	989	428	50	DNC
8	3-8	97	9	45	1631	470	269	15	DNC
9	3-9	111	15	80	2185	741	366	41	DNC
10	3-10	100	11	55	1726	572	251	8	DNC
11	4-0	158	8	40	844	388	232	11	DNC
12	r 4-0	127	12	63	1070	334	147	15	
13	4-0	133	20	100	2911	1051	545	68	DNC
14	4-1	126	7	36	791	178	100	3	
15	4-2	96	6	30	1550	303	127	24	DNC
16	4-2	125	13	66	1348	438	264	5	
17	4-2	129	10	49	1335	393	231	2	
18	r 4-3	142	5	26	484	110	58	2	
19	4-3	120	9	45	1365	447	269	24	DNC
20	4-4	130	8	40	929	347	232	4	DNC
21	4-4	113	1	45	1227	390	223	23	DNC
22	4-4	100	10	50	1385	430	290	14	DNC
23	4-4	138	6	30	1028	350	174	62	
24	r 4-5	111	8	38	621	244	127	8	
25	4-5	110	13	64	1234	485	295	9	
26	4-5	100	20	100	2078	648	297	8	
27	r 4-6	121	7	35	814	294	203	2	DNC
28	4-6	113	16	79	1444	491	342	15	
29	4-7	137	13	65	1106	408	160	15	
30	r 4-9	106	15	75	1906	558	332	25	DNC
31	4-9	115	6	28	575	104	59	8	
32	4-10	100	7	36	910	308	145	3	
33	4-11	116	8	41	682	200	98	8	
34	4-11	87	4	20	347	111	62	2	
35	5-2	113	3	15	291	142	93	1	DNC
Total			339	1719	47270	14628	7858	647	
Average					27.5	8.5	4.5	.4	

Reduction in time with successive repetitions for all children in this experiment is also shown by the averages as illustrated in figure 9. The average time for the group for the first repetition was 50.0 seconds and for the 100th repetition was 21.0 seconds. Reductions in errors also were found for unclassified, logical and perseverative errors respectively of 11.4 to 8.0, of 6.3 to 2.0 and of 0.7 to 0. Figure 10 shows curves of reductions in time and errors at intervals of ten repetitions for those completing the problem. The rise in the curve after the 80th trial may be largely explained by the dropping out of subjects requiring the fewer number of repetitions for completion of the problem and the small number of subjects remaining. None of the two and three year old children completely learned the problem.

TABLE 7

Distribution of classified errors for each subject for each row in Experiment III. UC - unclassified; L - logical; and P - perseverative.
Errors for each row.

Sub- ject	Trials	a			b			c			d			e		
		UC	L	P	UC	L	P	UC	L	P	UC	L	P	UC	L	P
1	30	45	0	3	87	27	13	90	44	10	60	43	6	74	74	5
2	15	32	0	5	41	11	6	45	19	8	30	23	3	30	30	0
3	85	137	0	4	213	67	25	175	95	3	235	154	20	120	120	6
4	60	88	0	2	125	50	6	218	111	13	172	115	2	164	164	5
5	35	64	0	0	14	3	2	143	71	6	42	38	0	104	104	1
6	13	21	0	1	52	16	7	28	13	5	39	28	4	19	19	1
7	85	177	0	3	348	91	29	80	35	9	265	183	2	119	119	7
8	45	93	0	3	25	6	7	168	85	2	60	54	3	124	124	0
9	80	140	0	5	116	34	14	222	106	2	156	119	13	107	107	7
10	55	103	0	0	205	55	4	31	15	0	159	107	1	74	74	3
11	40	74	0	1	26	8	3	107	58	0	72	57	7	109	109	0
12	63	20	0	0	109	20	4	155	79	8	23	21	3	27	27	0
13	100	175	0	5	163	47	25	341	169	23	179	136	11	193	193	4
14	36	23	0	0	12	3	1	63	29	1	46	34	1	34	34	0
15	30	57	0	1	70	22	5	87	41	10	78	53	8	11	11	0
16	66	106	0	0	5	1	0	120	65	4	74	65	1	133	133	0
17	49	64	0	0	25	6	0	150	74	1	49	46	1	105	105	0
18	26	5	0	0	39	9	2	4	2	2	45	30	0	17	17	0
19	45	75	0	1	12	3	1	161	80	8	73	60	12	126	126	2
20	40	26	0	0	21	6	2	144	72	2	43	41	0	113	113	0
21	45	36	0	1	79	21	10	93	45	4	96	71	6	86	86	2
22	50	48	0	2	34	12	6	136	72	0	74	68	5	138	138	1
23	30	64	0	5	68	15	15	70	34	14	74	55	16	70	70	12
24	38	38	0	0	6	2	0	121	53	6	43	36	2	36	36	0
25	64	81	0	1	16	6	0	179	89	2	79	70	6	130	130	0
26	100	71	0	1	229	61	6	86	44	1	236	168	0	24	24	0
27	35	6	0	0	22	5	1	132	65	1	38	37	0	96	96	0
28	79	15	0	0	2	0	0	227	110	12	108	93	2	139	139	1
29	65	100	0	0	74	21	5	170	84	9	45	36	1	19	19	0
30	75	31	0	0	40	10	8	305	149	15	88	88	2	94	94	0
31	28	12	0	0	25	8	2	20	9	3	23	18	1	24	24	2
32	36	50	0	0	92	23	0	24	11	0	92	61	1	50	50	2
33	41	53	0	1	5	1	0	83	42	6	30	26	1	29	29	0
34	20	26	0	1	11	2	1	22	11	0	20	17	0	32	32	0
35	15	15	0	0	3	2	0	59	28	1	30	18	0	45	45	0

Total 2175 0 46 2414 674 210 4259 2129 191 2978 2269 141 2815 2815 51

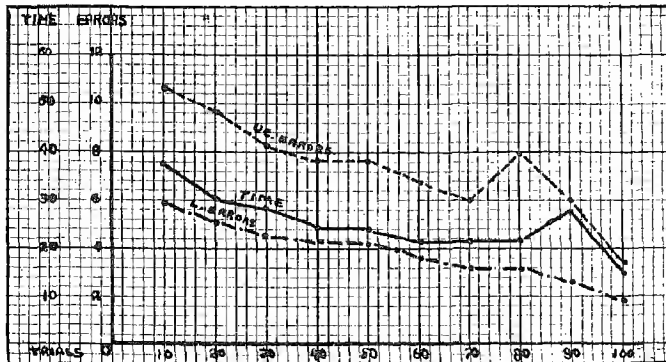


Figure 9.
Learning curves for time and errors based on
average scores for Form III.

TABLE 8

Distribution of correct responses for each subject for each row in Experiment III.

Subject	Trials	Correct responses for each row					
		a-3	b-1	c-5	d-2	e-4	Total
1	30	7	2	2	0	1	12
2	15	2	2	1	1	1	7
3	85	15	10	8	5	32	70
4	60	16	3	4	1	1	25
5	35	3	29	0	1	0	33
6	13	1	0	3	1	6	11
7	65	5	1	56	0	2	64
8	45	1	38	0	3	0	42
9	80	13	48	12	3	40	116
10	55	3	4	45	1	0	53
11	40	2	30	7	1	1	41
12	63	53	18	9	47	53	180
13	100	19	50	6	14	31	120
14	36	23	13	17	9	19	81
15	30	4	6	4	1	21	36
16	66	7	64	30	10	20	131
17	49	18	35	7	8	11	79
18	26	23	15	23	6	12	79
19	45	7	41	1	2	1	52
20	40	27	34	4	2	0	67
21	45	25	25	17	1	2	70
22	50	26	39	6	3	0	74
23	30	6	10	9	10	10	45
24	38	12	33	3	10	19	77
25	64	24	56	15	9	19	123
26	100	63	35	61	12	79	250
27	35	32	26	0	0	3	61
28	79	70	77	22	6	28	203
29	65	15	40	15	37	53	160
30	75	58	61	1	6	39	165
31	28	22	19	22	12	18	93
32	36	11	9	29	4	3	56
33	41	12	32	14	21	27	106
34	20	7	16	13	7	8	51
35	15	6	13	0	0	0	19
Total	1719	638	934	466	254	560	4571

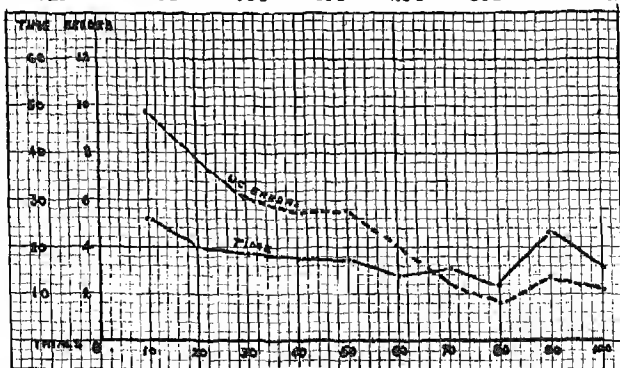


Figure 10.
Learning curves for time and unclassified errors
based on average scores of 15 children who
successfully completed Form III.

fifteen four year old children from this group successfully completed the learning in this experiment to the extent of three successive errorless repetitions. Only one child required more than 80 repetitions. He completed the problem in 100 repetitions.

Individual learning curves of four children are given in figures 11 and 12. All show a decided reduction in time and errors, as well as differences in repetitions required. The rise at the 40th trial in the curve of subject 16-III may be explained by a prolonged absence of 77 days.

Ten of the fifteen children who learned the problem in Form III relearned it, one after a period of two months and nine after a period of one week. In every instance there was a decided decrease in repetitions and in time and error scores. Further evidence of a rational approach to the problem was given in that only one perseverative error occurred in all the 93 repetitions made by the ten children. Logical errors were next in rate of decrease. Three of the ten children made no logical error and two made only one each.

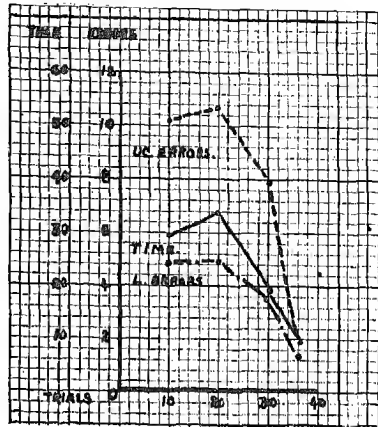


Figure 11. Learning curves for time and errors of subject 32-III

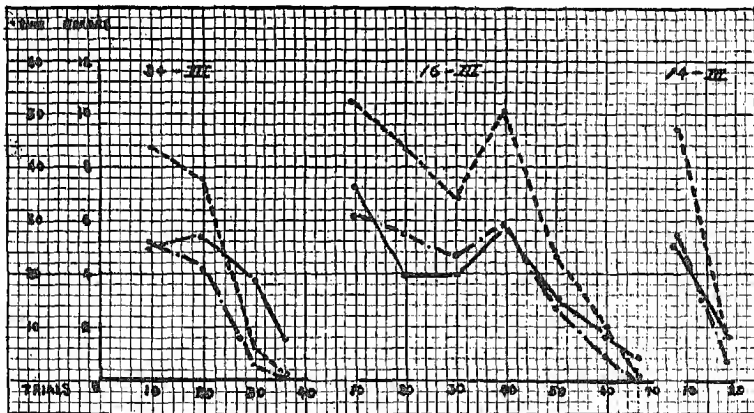


Figure 12.
Learning curves for time and errors of subject 34-III,
16-III, and 14-III. — Time. --- Unclassified errors
--- Logical errors.

Individual differences continued to have decided influence in this somewhat larger group of children in the third experiment. Results on the whole further strengthened the findings of the earlier experiment in relation to decrease in errors and in time required as the learning progressed. Particularly do the decreasing logical and perseverative error scores in the relearning seem to give further evidence of the ability of these children to use a rational organization of material such as this in the solution of a problem.

Comparative Analysis of the Three Forms

It has been shown by investigators that adults presented with a problem whose solution requires an elimination of errors are able to facilitate the solution by a so-called rational organization of material rather than by a trial and error method.

In this investigation it has been demonstrated that young children from two years, 4 months, to 5 years, 4 months, of age gave responses similar to those of adults. They require a longer time for learning and there has been more of the element of trial and error than in the case of adults. With learning distributed over a long period these young children have succeeded in arriving at the point where, through a voluntary choice shown by not touching bolts touched earlier in the experiment, errors have been reduced from the number made when each bolt was touched to the point where none was made and the criterion of three successive errorless repetitions was met.

Grouping errors under the three classifications of unclassified, logical and perseverative errors, it was found that in the early stages of the problem all three classes occurred. The number was determined largely by the child's method of beginning at the edge of the board or at some other point and proceeding in regular order to touch all bolts until he encountered the ringing one. As the learning progressed choices were made, the child not touching bolts that had already been found in that place in other rows and not logically correct.

All three classes of errors persisted to a certain degree even into the later stages but the data show a decrease with practice.

With the larger Haight Board the time required for learning such a complicated pattern and the difficulty of a mechanical nature occasioned by the necessity of such young children having to reach a long distance to touch the bolts in the top row made completion of learning inadvisable for them. They persisted in the problem to such an extent that even in the 24 repetitions a reduction of errors did occur.

With the smaller board of 5 ringing bolts three methods of procedure were followed. Eighteen children working for three minutes at a time attempted to learn the pattern by beginning at a certain place on the board, the bottom row, and proceeding by rows to the top row. Six working three minutes at a time were allowed to begin touching bolts at any point on the board and proceed in any way they wished. A third group of 35 children began at the extreme left in the bottom row and proceeded by rows to the top row. Variations in methods of procedure showed an advantage with regard to elimination of errors for the work limit of 5 trials a sitting over the time limit of 3 minutes of practice in one sitting.

The greatest number of errors was made with the trial and error form when the child was free to find the bells in any way he chose. Within the limits of the experiment only one child successfully completed the learning by the trial and error method of procedure. However, he attacked the problem vigorously and reached the criterion of success in an exceptionally small number of repetitions. Comparing the work limit of 5 trials at a sitting with the time limit of 3 minutes of practice, the latter has a slight advantage as regards the number of trials made by those successfully completing the experiment.

Of the twenty-one children from all groups who learned the problem to the extent of making three errorless repetitions 10 relearned it after an interval of one week according to the same criterion of success. Nine of these children made no perseverative errors. The total score for these ten was one perseverative error. Three of them made no logical error while the individual scores of all were reduced in every instance. Two children relearned the problem after an interval of two months. Their perseverative error scores were practically the same, while

their logical error scores were very greatly reduced.

SUMMARY AND CONCLUSIONS

In this study of a learning problem that permitted selection of response by the child and a rational method of solution sixty-seven children were tested. There were 42 boys and 25 girls. Three forms of procedure were used though the problem remained essentially the same.

The actual time required for such a problem does not appear to be as significant a measure as the number of errors. The time is a function of the method of attack upon the problem and the wide differences among individuals as to methods employed at various stages of learning would invalidate direct comparisons.

The errors have been grouped as logical, perseverative or unclassified. In the initial stages of learning the logical and perseverative errors are frequent but they decrease more rapidly than the unclassified errors do. The total number of errors made appears to be the best criterion of learning. The elimination of logical errors does show the ability of children as young as three years to use the method of learning termed rational for adults.

Learning appeared to be facilitated in part by the position of the ringing bolt on the board. There was a tendency for the first bolt in a row to be found more frequently without error and also for the correct bolt in the first row and in the last row to be learned earlier than those in the intermediate rows.

Ability to complete the problem and to make a rapid improvement in elimination of errors increases with age. No two-year-old child succeeded in making a final correct response within the limits of the experiment but almost attained success. The closing of the school interfered with their achieving the stage of efficiency set as a criterion. Children who were exactly 4 years of age at the beginning of the experiment did succeed. The number of repetitions necessary for solution decreased with the age of the child with some exceptions. It does appear that a child who shows greater ability in other performances such as give higher intelligence quotients also makes more rapid improvement in this form of learning.

Wide individual differences in performance occurred as measured by the time taken and by the number of errors occurring. This was noted for all children, for those successfully learning the problem and for those partially completing it. Study of the individual records of children in this form of learning shows that the trial and error method of the initial stages is replaced by a rational organization of material.

REFERENCES

- (1) Garrison, K. G.: An analytic study of rational learning.
George Peabody College for Teachers Cont. to Educ., 1928, No.44, 1-156.
- (2) Haught, B. F.: The intercorrelation of some higher learning processes.
Psychol. Monog., 1921, 30, No. 6.
- (3) Heron, W. T. : Individual differences in ability versus chance in the learning of the maze. Comp. Psychol. Monog., 1924, 2, No. 8.
- (4) Peterson, J. : Experiments in rational learning. Psychol. Rev., 1918, 25, 443-467.
- (5) Peterson, J. : The comparative abilities of white and negro children.
Comp. Psychol. Monog., 1923, 1, No.5.

- (6) Peterson, J., Lanier, L. H. and Walker, H. M.: Comparisons of white and negro children in certain ingenuity and speed tests. Jour. Comp. Psychol., 1925, 5, 271-283.
- (7) Peterson, J., and Lanier, L. H.: Studies in the comparative abilities of whites and negroes. Ment. Meas. Monog. No. 5, Feb. 1929.
- (8) Peterson, J., and Telford, C. W.: Results of group and individual tests applied to practically pure-blood negroes on St. Helena Island. Jour. Comp. Psychol., 1930, 11, 115-144.
- (9) Sunne, D.: Comparative study of white and negro children. J. Appl. Psychol., 1917, 1, 71-84.
- (10) Young, H. H.: Slot maze A. Psychol. Clin., 1916-17, 10, 112-116.

HEIGHT, WEIGHT, AND AGE TABLES FOR HOMOGENEOUS GROUPS

With Particular Reference to
Navaho Indians and Dutch Whites

MORRIS STEGGERDA and PAUL DENSEN¹

INTRODUCTION

Height and weight tables are used extensively throughout the United States by individuals, schools, insurance companies, and other organizations. Most of these tables are made up without consideration of racial characteristics. Popular data for the average American child are gathered from all races and nationalities. Thus the short Greek and the tall Swede go to make up this average, and then Indian, negro, white and other children are all compared with this "patch-quilt" average.

If the weights of these individuals are referred to these tables for comparison some consideration of this procedure should be taken since misinterpretation of the results may occur when it is overlooked. For example, among the Pueblo Indians in the southwestern part of the United States, it was found that the Indian children were considered underweight when compared with average weights set up in tables of the type described above. They were fed cod-liver oil and fattening foods in order to combat this situation but with little avail.

Among the Navahos the season of the year is also important. When the children enter the boarding schools, for example, after living a nomadic existence of two or three months with their parents, they immediately gain in weight. Thus not only the racial group should be considered but also the local characteristics of the population should be mentioned.

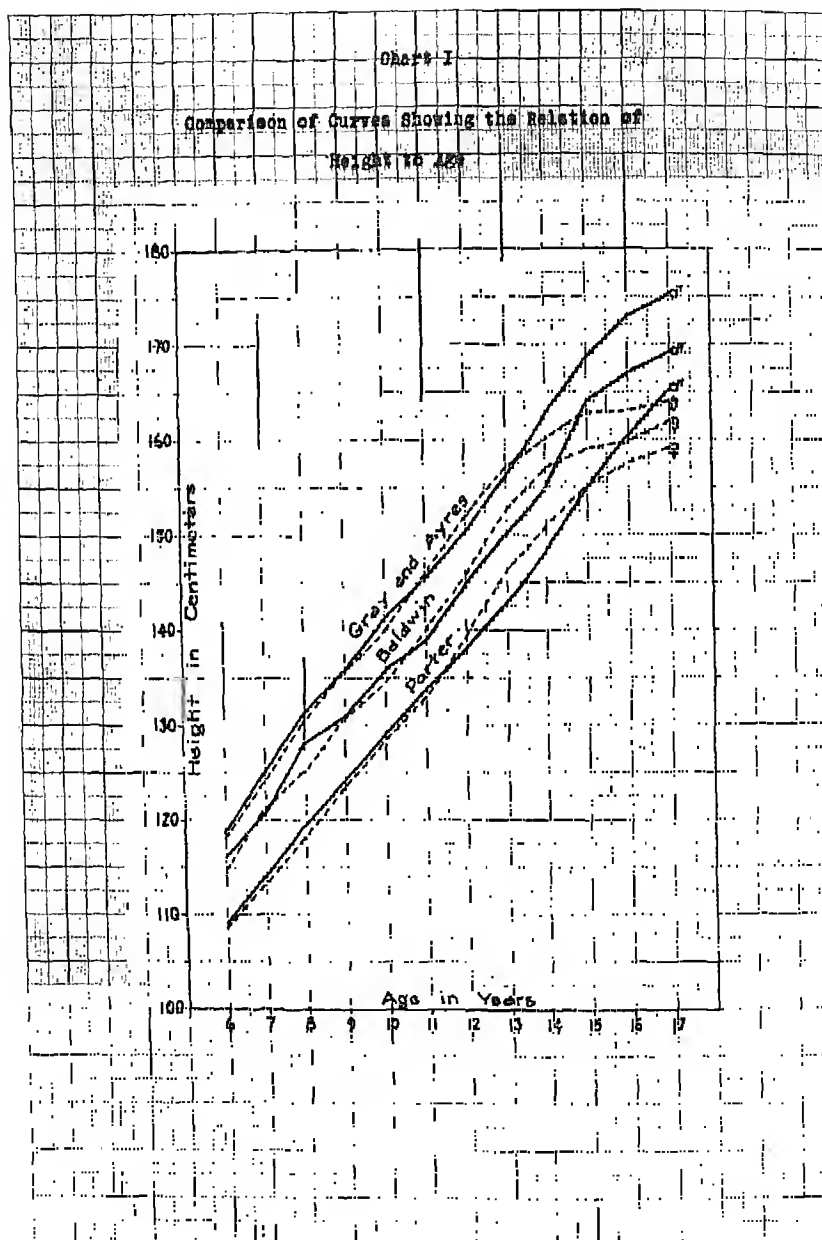
The compilation of separate height and weight charts for homogeneous racial groups was first suggested when the data of Gray and Ayres (1931) on white children in private schools, Baldwin's data (1921) on public school children, and those of Porter (1894) on white children in St. Louis were plotted together in one graph. These curves (Chart I) differ consistently from one another. In other words, there are three different sets of averages for three different groups of individuals, all of whom are of the same race. When individuals are compared with some given standard it is assumed that the same forces which operated to produce the standard operate upon the individual. This is only necessarily true when the standard used is made up from the individuals with whom it is compared. Hence it was deemed preferable, when homogeneous groups were available, to prepare height and weight tables specifically for each group. It is the purpose of this paper to present such tables specific for the Navaho Indians in the schools of the southwest and for Dutch white school children of Holland, Michigan.

MATERIAL AND METHODS

The anthropometric data for the Indian children were collected from schools on the Navaho reservation in New Mexico and Arizona. These include government boarding schools, some day schools, and the mission boarding schools. Care was taken to select those children who were relatively pure Navaho, e.g. those who were known to have any white blood were excluded from this study. The data for the Dutch white children were collected in the schools of Holland, Michigan, and only those whose ancestors came from the Netherlands were used in making the table.

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The authors are indebted to Dr. Margaret Merrill and Dr. C.E. Palmer, of the Department of Biostatistics, School of Hygiene and Public Health, Johns Hopkins University, for suggestions and criticisms in this study.



A total of 3332 Navaho boys and girls between the ages of six and eighteen were measured. The Dutch whites measured numbered 3730, between the ages of six and fifteen. Believing that the mean heights and weights for children of these two races by ages would be useful to anthropologists we supply Table 1.

The method of taking measurements was as follows: For taking height the subject was told to stand erect, with heels close together, the head being held in the "Frankfort horizontal." The anthropometer was held as closely to the vertical position as possible, and the rod left unsupported for a fraction of a second, so as to test its verticality. The distance from the highest point of the head to the floor was considered the vertex height, or stature.

All weights were taken on a portable balance scale. Clothing was reduced to a minimum, with shoes prohibited. Boys and little girls were generally weighed in their underclothing; older girls in nightgowns in the dormitories. The average weight of this minimum clothing was taken and subtracted from the given weight.

Age was taken to the nearest birthday for both groups. However, in the case of the Navahos where birth dates are not always available, the school records were checked against the age stated by the child, and where a variation of two or more years occurred, the measurements were omitted.

Height and weight tables are usually prepared by computing the average weight for a particular age and height class. This was done in the present study by computing equations of average relationship between height and weight by the usual least-squares method and then substituting specific heights in the equations to obtain average weights for these heights.

In computing these equations it was assumed that the relationship between height and weight is of a linear nature. That this assumption is permissible is shown by a comparison, for each of the ages studied, of the correlation coefficient with the correlation ratio by means of Elakeman's test. The difference between the two coefficients was not statistically significant.

In order to facilitate the computations it was decided to use distributions of fifty individuals drawn at random in each age and sex class rather than the larger distributions. The largest probable error of the means for weight in the distributions of fifty individuals was 2.2 pounds in the 15 year old class for Dutch boys. This is a small degree of variability, when the accuracy required in the use to which these tables are put, is considered. Moreover the variability of weight tends to increase with age and this is the highest age class for the Dutch.

RESULTS

It will be seen from Plate I and Chart II that the weight prediction for the Navahos is less than that for the Dutch whites. This may be explained on a racial basis. However, the Dutch have smaller weights than those of a usual height and weight table for American whites of the type referred to in paragraph 1, prepared by Mead and Johnson. The reason for this is difficult to explain, except that the Dutch as a race are tall and of a rather slender build, and thus, although tall do not necessarily weigh more. This illustrates again the importance of height and weight tables for homogeneous groups. Further, the sex difference for weight in this Dutch series is not as large as is found in the height and weight table of Mead and Johnson.

Most height and weight tables give the heights and weights for average individuals. However, practically all individuals deviate from the average to some extent. An auxiliary table of average deviations for each age and sex is supplied on each of the height and weight tables.

Chart II

Comparison of Curves for Weight

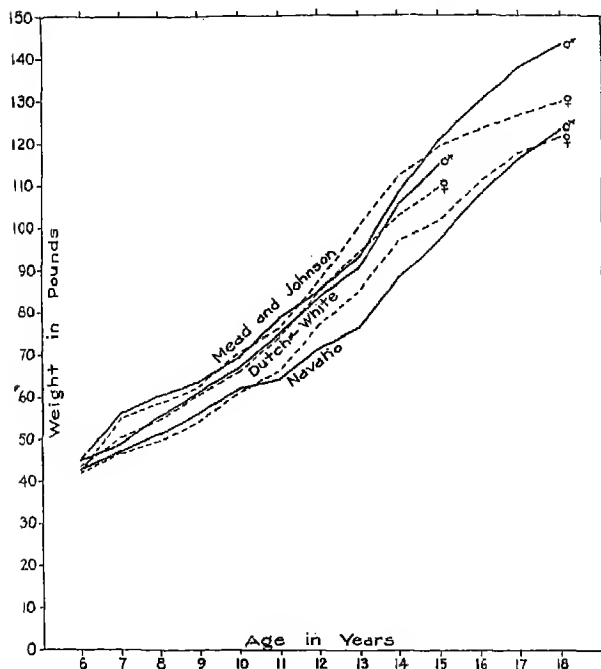


TABLE 1

Mean Heights and Weights for Navaho and Dutch Children

Navaho							Dutch						
Boys				Girls			Boys				Girls		
Age	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	No.	Height	Weight	
6	76	45.69±.16	44.34±.37	65	44.65±.15	41.65±.39	144	46.20±.10	45.54±.28	137	46.04±.12	44.19±.38	
7	101	47.56±.15	47.65±.41	99	46.87±.13	46.65±.39	220	48.55±.10	50.59±.31	188	48.24±.10	49.53±.34	
8	132	49.50±.11	52.78±.37	104	48.70±.13	50.75±.44	232	50.79±.10	55.15±.31	204	50.40±.10	54.82±.37	
9	143	51.63±.12	57.87±.39	133	51.15±.13	56.25±.43	221	53.03±.10	61.69±.38	180	52.13±.13	61.20±.56	
10	166	53.28±.10	62.51±.33	153	53.10±.11	62.30±.40	192	54.60±.12	67.24±.51	204	54.61±.13	66.12±.54	
11	153	54.67±.11	66.81±.47	145	55.21±.12	66.73±.50	189	56.61±.12	74.46±.52	177	56.85±.14	74.63±.72	
12	185	56.28±.11	72.14±.43	144	56.65±.11	76.17±.58	184	59.01±.12	82.93±.79	161	59.47±.16	84.58±.91	
13	197	58.75±.12	80.43±.55	168	59.12±.10	85.75±.65	183	61.13±.15	90.45±.82	213	61.87±.14	95.22±.94	
14	196	60.56±.12	90.65±.59	153	60.22±.10	95.89±.65	192	63.83±.16	101.09±.89	207	63.55±.13	103.98±.83	
15	133	63.18±.13	99.71±.73	136	61.14±.10	104.98±.71	149	66.39±.19	111.40±.108	153	64.08±.12	107.46±.92	
16	103	65.17±.13	110.01±.73	111	61.55±.09	112.50±.73							
17	83	65.95±.12	110.81±.76	79	61.95±.12	115.10±.98							
18	76	66.72±.14	123.01±.84	79	62.00±.13	116.71±.05							

Height is in inches; weight in pounds

Plate I.

A HEIGHT WEIGHT AGE TABLE FOR NAVAHOS 8 TO 18 YEARS

BOYS																
HEIGHT INCHES	AGE IN YEARS															
	8	9	10	11	12	13	14	15	16	17	18					
41																
42	38	38														
43	39	39														
44	40	40														
45		42	43													
46	44	44	45													
47	45	45	46													
48	46	46	47													
49	47	47	48													
50		51	52													
51	51	52	53													
52	52	53	54													
53		54	55													
54	54	55	56													
55		56	57													
56	56	57	58													
57		58	59													
58	58	59	60													
59		60	61													
60	60	61	62													
61		62	63													
62	62	63	64													
63		64	65													
64	64	65	66													
65		66	67													
66	66	67	68													
67		68	69													
68	68	69	70													
69		70	71													
70	70	71	72													

AGE	AVERAGE DEVIATION IN POUNDS FROM WEIGHTS IN TABLE	
	GIRLS	BOYS
6	8	2
7	3	3
8	3	3
9	3	3
10	4	3
11	5	4
12	5	4
13	6	5
14	6	5
15	6	7
16	9	7
17	9	9
18	9	7

A HEIGHT WEIGHT AGE TABLE FOR DUTCH WHITES 8 TO 18 YEARS MEASURED IN HOLLAND, MICH.

BOYS																
HEIGHT INCHES	AGE IN YEARS															
	8	9	10	11	12	13	14	15	16	17	18					
41																
42																
43	38															
44	41															
45		43	43													
46	43	43	44													
47	45	45	47													
48	47	47	48													
49	49	49	51													
50		51	52													
51	51	52	53													
52	52	53	54													
53		54	55													
54	54	55	56													
55		56	57													
56	56	57	58													
57		58	59													
58	58	59	60													
59		60	61													
60	60	61	62													
61		62	63													
62	62	63	64													
63		64	65													
64	64	65	66													
65		66	67													
66	66	67	68													
67		68	69													
68	68	69	70													
69		70	71													
70	70	71	72													

AGE	AVERAGE DEVIATION IN POUNDS FROM WEIGHTS IN TABLE	
	GIRLS	BOYS
6	6	3
7	3	3
8	4	4
9	4	4
10	6	4
11	7	6
12	7	6
13	11	6
14	11	6
15	11	10

These deviations were obtained by averaging the differences between the actual weights of a given age and sex class. It will be noted that the average deviation for the younger ages is not as large as for the older ages.

These average deviations may be interpreted as follows: A particular eight year old Dutch boy, fifty inches tall, weighs fifty-eight pounds. The average weight for boys of his age and height is fifty-four pounds. Thus he weighs four pounds more than the average. The auxiliary table tells us that this is one average deviation in weight from the weight in the tables. Statistically this means that this particular Dutch boy deviates from the weight in the table more than do 58 out of every 100 similar eight year old Dutch boys. If the same boy deviated from the weight in the table by two average deviations, or eight pounds, he would deviate more than 90 per cent of the people in a similar distribution. Obviously, if 90 per cent of the people are closer to the weight in the table than he, he is considerably over average.

SUMMARY

1) Height and weight tables are presented specific for the Navaho Indians of the southwest and the Dutch whites of Holland, Michigan. Auxiliary tables are presented showing the average deviation from the weights in the height and weight tables.

2) The weights for specific heights in the tables for Navahos and Dutch white children are generally lower than those in a popular type table based on measurements of American children in general prepared by Mead and Johnson.

REFERENCES

- Baldwin, B.T. 1921. The physical growth of children from birth to maturity. Publication of Iowa Child Welfare Research Station. Vol. 1, No. 1.
- Baldwin, B.T. 1925. Weight, height and age standards in metric units for American-born children. *Am. Jour. Phys. Anthropol.* 8:1-10.
- Clark, Sydenstricker and Collins. 1922. Heights and weights of school children, U.S. Public Health Reports 37:1185-1207. Reprint No. 750.
- Davenport, C.B., Morris Steggerda and William Drager. 1934. Critical examination of physical anthropometry on the living. *Proc. of Amer. Acad. of Arts and Sciences* 69:265-284.
- Dublin, L.I. and J.C. Gebhart. 1924. Do height and weight tables identify undernourished children. *N.Y. Assoc. for the Improvement of the Condition of the Poor*.
- Franzen, R. 1929. Physical measures of growth and nutrition. *School Health Research Monograph*, No. 2, Am. Child Health Association.
- Gray, H. and J.G. Ayres. 1931. Growth in private school children. University of Chicago Press.
- Gray, H. and K.M. Gray. 1917. Normal weight. *Boston Med. and Surg. Jour.* 177: 894.
- Meredith, H.V. 1935. The rhythm of physical growth. *Univ. of Iowa Studies in Child Welfare*. Vol. II, No. 3.
- Porter, W.T. 1894. The growth of St. Louis children. *Transactions of the Acad. of Science of St. Louis* 6:263-380.

MODES OF THOUGHT IN HIGH SCHOOL PUPILS

HERMAN ASCH¹

Personal and classroom contacts with boys and girls have led me to believe that, barring the mentally defective, there is no such thing as a pupil who cannot be taught. In September, 1934, I found myself in a position which enabled me partly to test the validity of this belief, for I was assigned to teach a class of thirty-two boys and girls who were unsuccessful in their school work.

For this study I used three third term classes: (1) A straight promotion or backward class (register 32); (2) A regular class (register 36); and (3) An honor class (register 32). In the regular and honor classes pupils were promoted on merit, while in the straight promotion class (backward pupils) they were advanced regardless of merit.

Each class was given two tests:

1. A Reasoning Test - The purpose was to determine the number of correct reasons a pupil can give for a stated fact.

2. An Instruction Test - The purpose was to determine the pupil's ability to follow instructions.

In the Reasoning Test the pupils were allowed two and one-half minutes to give as many reasons as they could for each question. The following questions were given:

Question 1.

During a baseball game the batter struck the ball. Immediately an argument arose, some claiming it a "fair" ball and some a "foul" ball. Give as many reasons as you can to account for the difference of opinion.

Question 2.

I have observed that the doors of a comfort station are cream colored. Give as many reasons as you can to account for the fact that the woodwork around the door knob of the men's entrance is dirtier than the woodwork around the door knob of the women's entrance.

Question 3.

The sign in the trolley car reads: "Leave by the rear door to avoid delay," yet we find many people leaving by the front door. Give as many reasons as you can for this.

Question 4.

Although the request for good manners and clean personal habits is constantly made, pupils are frequently known to lack them. Give as many reasons as you can to account for this.

Question 5.

All pupils know that to cheat during a test, copy home work, or any such act does not help develop them morally or mentally, yet we frequently find pupils who do this. Give as many reasons as you can to account for this.

¹ From James Monroe High School, New York City.

Herewith are samples of answers to questions 2 and 3 and method of evaluating them with regard to their acceptance or rejection as a reason.

Answers to Question 2.

1. More men use the public comfort station than women.
2. Most women's hands are cleaner.
3. Men do dirtier work.
4. Men are more liable to push the door by resting the hand on wood-work than women.
5. Men's hands are generally dirtier than women's.
6. Average woman cleaner than the average man.
7. Maybe a janitor forgot to clean the men's entrance.

Where answers 3 and 5 appeared on one paper, only one was accepted. Where 2 and 6 appeared on the same paper only one was accepted. Answer 7 was not accepted.

Answers to Question 3.

1. Did not want to go to the back door.
2. Front of car may be less crowded than the rear.
3. Maybe he was sitting near the front door.
4. Wanted to try to save a few steps.
5. Maybe it was bad weather outside and he wanted to get off nearer to the corner.
6. Maybe he just got on and had no time to walk to the back.
7. Did not think.
8. Maybe he wanted to catch the car in front of him.
9. Maybe the front of the car was so crowded he could not reach the back when he entered.
10. He may have been waiting to hear the motorman announce a street.
11. He may have been waiting to ask the motorman a question.
12. He might have met a friend who was seated near the front of the car and had stopped to talk to him.

Answer 1 was not accepted. Where 4, 5 and 8 appeared on one paper, only one answer was accepted. Where 10 and 11 appeared on one paper, only one answer was accepted.

Underlying principle of evaluation:

1. Every possibility accepted as a correct answer.
2. Any number of answers showing similar thought processes were credited as one answer.
3. Answers showing no thought were not accepted.
4. Where opposing answers were given, only one was accepted.

The number of students giving correct responses are shown in Figures 1 to 5. From the graphs we can see that our so-called good pupils cannot analyze a problem from as many points of view as our so-called poor pupils.

In the Instruction Test each pupil was given a piece of ruled white paper and told to put nothing on it but that which he is instructed. For each instruction which was carefully read, he was allowed thirty seconds.

Instruction test.

1. Print your last name on the first line in the upper left hand corner of your paper.
2. Place a comma after your name.

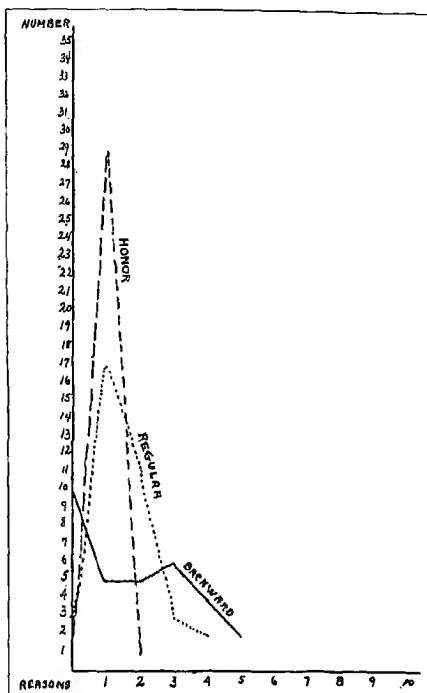


Figure 1.
Question 1. Baseball game.
Distribution of number of reasons given by
each group.

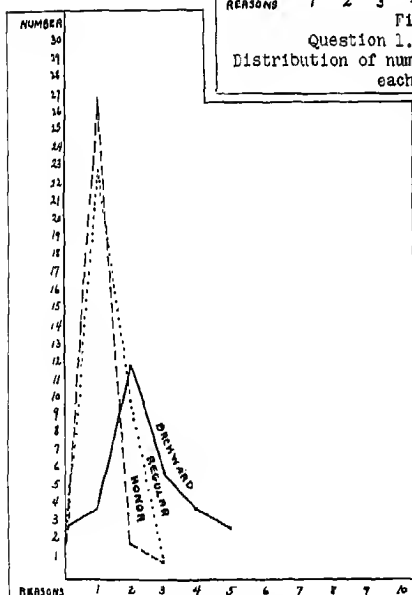


Figure 2.
Question 2. Woodwork around door.
Distribution of number of reasons given by
each group.

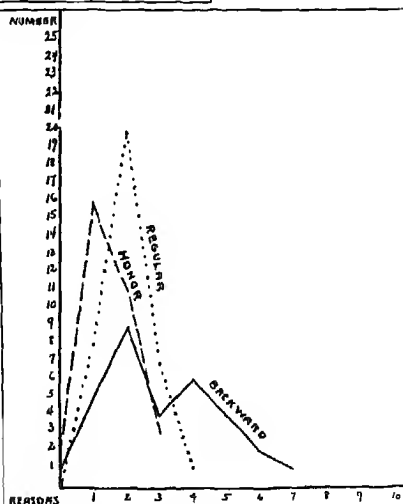
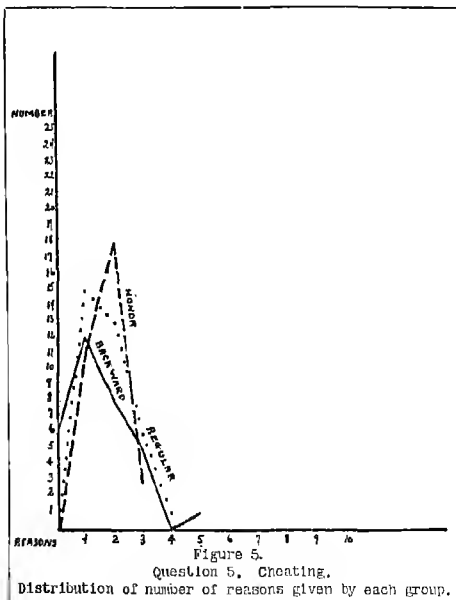
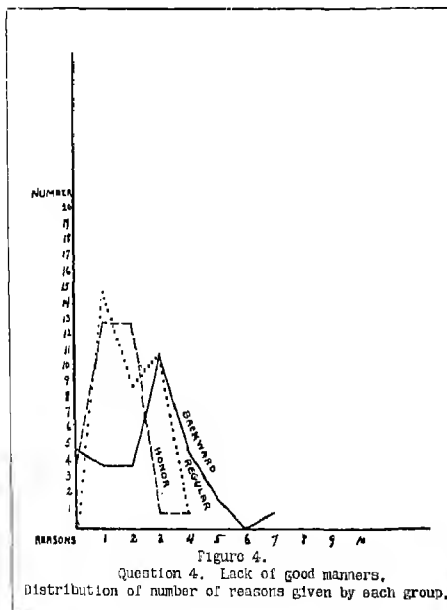


Figure 3.
Question 3. Sign in trolley car.
Distribution of number of reasons given by
each group.

3. Write your first name two inches to the right of the comma.
4. On the fourth line below your last name draw a line about two inches long.
5. Two inches to the right of the line just drawn and on the line below it make four circles each about $\frac{3}{8}$ ths of an inch in diameter.
6. In the center of your paper draw a four inch square.
7. Inside the square draw a line from the center of the top line to the left hand corner of the square.
8. Now draw a line from the center of the top line to the right hand lower corner of the square.
9. In the center of your diagram draw a two inch circle.
10. Print your name inside the circle - last name first.

In studying the answers to these questions I found no errors until I came to the answer to instruction 6. Every one of the 100 pupils made the same error which consisted of making the four inch square in the center of the unused part of the paper instead of in center of the paper as stated.

I am not interested in the right or wrong of the pupils making this error. What does interest me is that 32 poor pupils, 36 regular pupils and 32 honor pupils made identically the same error, thus inferring that there is a common mode of thought and training. No conclusion is drawn from these meagre tests. However, I believe that the results received warrant further investigation.



MOTIVATION OF YOUNG CHILDREN: FURTHER STUDIES IN
SUCCESS AND FAILURE, PRAISE AND BLAME

HAROLD H. ANDERSON*

Motivation in this investigation is measured by performance of young children on a hand dynamometer. This study is a continuation of two studies made at the Iowa Child Welfare Research Station and previously reported by Chase¹ and Anderson and Smith².

A summary of the procedure of the Chase study taken from Anderson and Smith (p. 138) states the essential background for the problems and data discussed here.

"The purpose of Chase's investigation was 'to obtain data on the relative effectiveness of a number of different types of external incentives which have been given under controlled and experimental conditions with four comparable groups of children ranging in age from two to eight years.' (2 (Chase) , p. 31) These groups were designated by the letters A, B, C, and D, respectively.

"Each child was given three series of strength tests at intervals of one week on a hand dynamometer devised especially for the Chase study. Each series consisted of seven trials on the strength test; only the scores of the last six were used in the computations. In the first test, Series I, the children in all groups received the same instructions with no knowledge of results, the recording apparatus being concealed behind a screen.

"In Series II, given one week after the first, a separate procedure was followed for each of the four groups. Group A, known as the control group, was given for the first, second, and third weeks the same procedure with no knowledge of results. Individuals in Groups B, C, and D, irrespective of their performance scores, were made to believe the second week (Series II) that through their efforts they had succeeded in ringing a bell which had actually been rung from a button pressed at the appropriate moment by the experimenter's foot. Group B, following the success on each of the seven trials, was given a mere repetition of the instructions: 'I want you to try again. When I say "ready squeeze," I want to see if you can make the bell ring. Ready, squeeze.' Following the success on each of the seven trials, Group C was praised in the language and manner described by Chase (2 (Chase) , p. 67). Group D, following the success on each of the seven trials, was given a reward in the form of a gold star which had been promised on the condition of ringing the bell.

"During the third week the tests and situations in Series III were given. Each child in Group A, as stated, received the same control-motivation as was given in Series I and Series II, that is, no knowledge of results and a mere repetition of instructions. Individuals in Groups B, C, and D, irrespective of their performance scores on the seven trials of this series, were led to believe that they had failed to ring the bell. Group B was given a repetition of instructions as in Series II after failure to ring the bell on each of the seven trials. Following each of

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¹ Chase, Lucile: Motivation of Young Children: An Experimental Study of the Influence of Certain Types of External Incentives Upon the Performance of a Task. Univ. Iowa Stud., Stud. in Child Welfare, 1932, 5, No. 3, Pp. 119.

² Anderson, Harold H., and Smith, Ruth Sloan: Motivation of Young Children: The Constancy of Certain Behavior Patterns. J. Exper. Educ., 1933-1934, 2, 138-160.

the seven successive failures, Group C was reproved as described by Chase (2, (Chase), p. 68). Each child in Group D, after each respective failure, was supposedly punished by having a red button cut off a paper 'gingerbread boy' which had previously been given to him with the warning that the experimenter would be obliged to cut off a button each time he failed to ring the bell."³

The tabular form will give a more concise presentation of the plan for the various motivational situations according to groups of children and the successive series of tests administered at weekly intervals:

Group	Series I	Series II	Series III
A	Control-motivation	Control-motivation	Control-motivation
B	Control-motivation	Success-repetition	Failure-repetition
C	Control-motivation	Success-praise	Failure-reproof
D	Control-motivation	Success-reward	Failure-punishment

The apparatus used in collecting additional data for this study was the original motivation hand-dynamometer which was devised to serve two purposes in the Chase study: (1) to enable the experimenter to obtain a record of the amount of force exerted by the child in squeezing the levers, and (2) to control the apparent results of performance seen by the child. A main water and lever system operated by the child served the first; the secondary water system and the train system operated by the experimenter served the second purpose.

The child squeezed two levers which, operating like a pair of forceps, squeezed a rubber bulb in the main water system, forcing red colored water through rubber tubes to an upright glass tube on the side of the apparatus visible only to the experimenter. The height of this column of water could be read from a paper meter scale placed behind the tube. By means of a one-way valve the liquid was maintained at its highest level while the score was being read. The water was then released through a stopcock and permitted to flow back into the main system for the next trial.

When it was necessary in the experiment for the child to believe that he was succeeding or that he was failing, he was shown this apparent performance in one of two ways. The first consisted of the water system operated by the experimenter with a rubber bulb concealed beneath the table and an upright glass tube visible to the child and to the experimenter. The second consisted of a train mounted on a movable lever which permitted it to run in an arc along a track.

Chase used these two methods, the water system for success and the train system for failure, because she believed a change in the appearance of the apparatus would reduce the carry-over from the situation of success to that of failure. When the child was to have no goal and no knowledge of results, as in control-motivation, the train system was removed and the post supporting the two upright glass tubes was covered by a cardboard screen. Under all conditions, the child squeezed the hand levers forcing liquid into the back tube, which was always visible to the experimenter.

³ See Chase (p. 68) for complete directions and explanation of procedure in giving the three experimental test presentations.

The present study is concerned only with that part of the Chase procedure in which the hand-dynamometer was used.

Chase in her study of 213 children between the ages of two and eight found certain differences in performance among the four motivation groups and between the series in the test situations. Some of these differences were significant, some approached significance, and some were not significant. In general the same tendencies as shown by mean scores were found three years later when 102 of the Chase subjects were retested by the same procedure.

Table 1 adapted from Anderson and Smith (p. 144-146), shows for the 102 children for both the original Chase data and the Smith retest data the differences in mean scores of the groups, the probable errors of these differences, and the critical ratios of these differences.

TABLE 1

Reliability of Differences of Means of Groups in Series I, II, III, I and II, II and III, and I and III for Selected Chase and Smith Retest Subjects

Selected Chase Subjects (Entire Group, 102 Children)				Smith Retest Subjects (Entire Group, 102 Children)			
Group	Mean Difference	Probable error of difference	Ratio of Difference to Probable Error of Difference	Group	Mean Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference
Series I							
AI* and BI	.50	.54	.94	AI* and BI	.87	.63	1.36
AI and CI*	.16	.55	.29	AI and CI*	.98	.72	1.35
AI* and DI	.16	.57	.28	AI* and DI	.98	.71	1.37
BI and CI*	.66	.48	1.38	BI and CI*	1.84	.57	3.20
BI and DI*	.34	.49	.69	BI and DI*	1.84	.56	3.32
CI* and DI	.32	.51	.63	CI* and DI	.00	.73	.04
Series II							
AII and BII*	1.71	.58	2.95	AII and BII*	2.76	.73	3.81
AII and CII*	2.21	.62	3.56	AII and CII*	2.91	.86	3.38
AII and DII*	2.86	.60	4.77	AII and DII*	4.09	.79	5.12
BII and CII*	.50	.59	.85	BII and CII*	.15	.75	.11
BII and DII*	1.15	.57	2.02	BI and DII*	1.32	.68	1.95
CII and DII*	.65	.61	1.07	CII and DII*	1.18	.80	1.46
Series III							
AIII and BIII*	3.49	.60	5.92	AIII and BIII*	2.65	.69	3.83
AIII and CIII*	4.24	.58	7.43	AIII and CIII*	4.84	.71	6.85
AIII and DIII*	4.31	.64	6.73	AIII and DIII*	4.81	.73	6.63
BIII and CIII*	.75	.61	1.25	BIII and CIII*	2.19	.65	3.34
BIII and DIII*	.82	.67	1.22	BIII and DIII*	2.16	.68	3.20
CIII and DIII*	.07	.65	.11	CIII and DIII*	.03	.69	.04
Series I and II							
AI* and AII	.46	.17	2.70	AI* and AII	.63	.43	1.45
BI and BII*	1.75	.26	6.73	BI and BII*	3.00	.34	8.90
CI and CII*	1.59	.30	5.30	CI and CII*	1.71	.50	2.61
DI and DII*	2.56	.25	10.24	DI and DII*	2.48	.12	20.50
Series I and III							
AI* and AIII	1.23	.16	7.69	AI and AIII*	.45	.29	1.57
BI and BIII*	2.76	.31	9.20	BI and BIII*	3.96	.47	8.36
CI and CIII*	2.83	.19	15.00	CI and CIII*	4.31	.44	9.84
DI and DIII*	3.24	.25	12.96	DI and DIII*	4.28	.41	10.36
Series II and III							
AII* and AIII	.77	.09	8.56	AII and AIII*	1.08	.41	2.60
BII and BIII*	1.01	.23	4.39	BII and BIII*	.96	.31	3.16
CII and CIII*	1.26	.14	9.00	CII and CIII*	3.00	.37	8.20
DII and DIII*	.68	.21	3.24	DII and DIII*	1.80	.33	5.54

* Indicates greater mean.

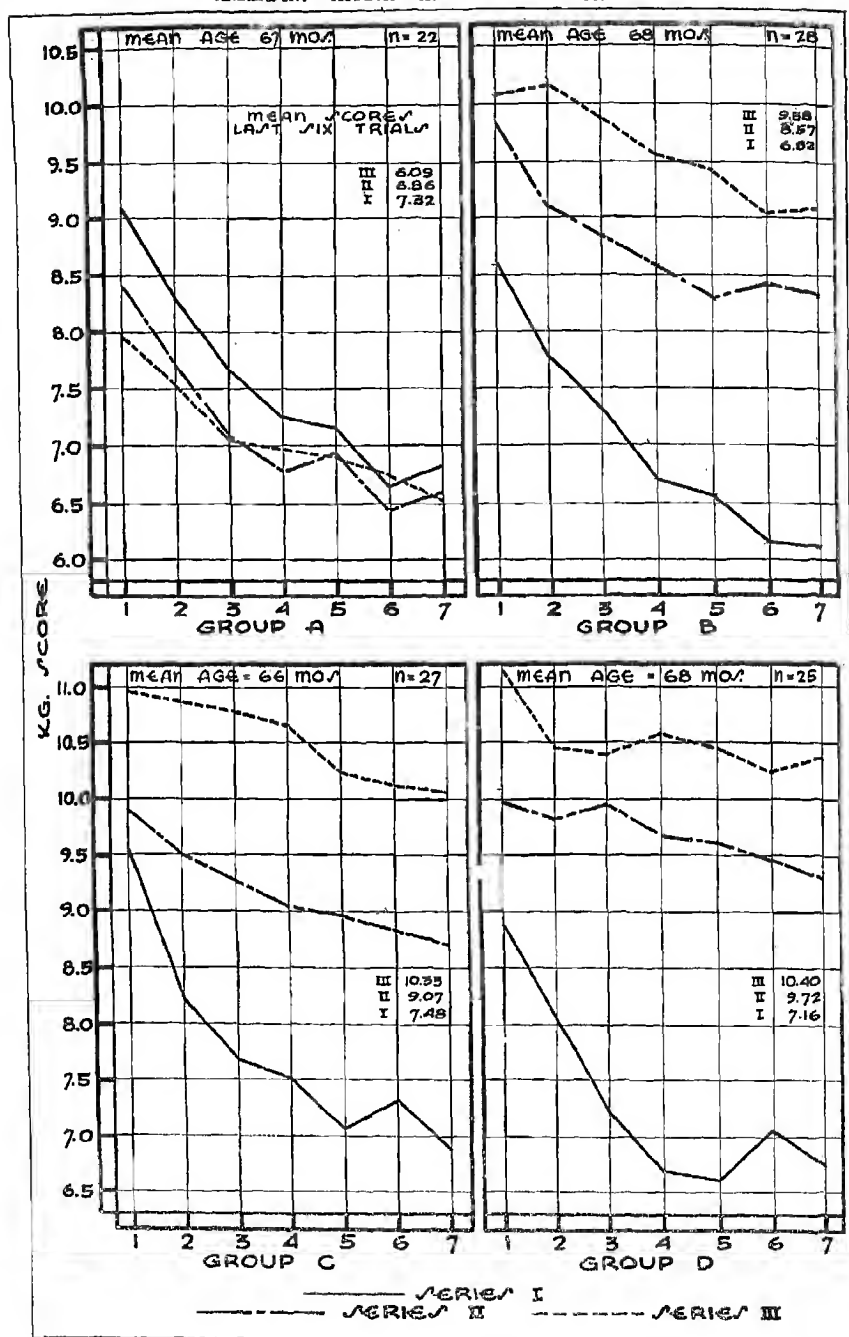


Figure 1
Graphs of Mean Trial Scores for Each of the Seven Trials for All Subjects
by Series in Groups A, B, C, D for the 102 Selected Chase Subjects.

Series I is control motivation for all groups - A, B, C, and D. The mean initial effort in all groups falls within a range of less than one kilogram. The means computed from the last six trials of groups B, C, and D lie within the range of .66 kilograms. Moreover, the tendencies of the curves are similar. The conclusion seems to be properly drawn by Chase that control motivation (Series I) in all four groups was practically the same.

In Group A, which received control motivation on all three series, the tendencies of the curves are likewise similar. The initial trials decrease from week to week. The seventh trials of all three curves lie within the negligible range of .22 kilograms. In spite of this, there are significant differences in mean group scores for the last six trials as between Series I and III and between Series II and III, the performance in Series III being lower in both comparisons. Practice effects, if any, are affecting performance adversely.

In Group B, however, the tendencies are different. This group of children experienced both success and failure with repetition of instructions after each trial. The curve for success and failure each show greater resistance against fatigue than does the curve for no knowledge of results. The mean group scores for the last six trials show significant differences in all three comparisons between series. That is, according to the Chase method of analysis, failure is a significantly greater motivation than success, and both failure and success are greater than the control motivation.

When the children came back the second week and were given a chance, as they thought, through their own efforts to ring the bell, they showed a mean score on the first trial considerably higher than they did the preceding week when they had no possibility of knowing what they were achieving.

Since there were no practice effects operating to increase the initial score of Series II in Group A, one variable which can account for the greater initial effort is the introduction of a definite goal for the child. This higher initial score is seen in all cases in this experiment where a definite goal has been offered the child.

The drop in mean scores after success in the first trial is not as steep as in control motivation, and the success curve tends to flatten out horizontally at the end.

The third week the children came back and experienced failure after a still slightly higher initial trial. But the first three trials exceed any of the mean trial scores for success, and the remaining trials show a tendency for failure to parallel success although at a higher performance level.

Inspection of the curves for Groups C and D show similar tendencies. In these two groups the comparisons of mean group scores for the last six trials show significant differences except as between D-II and D-III. In Group D it is impossible to account for the fact that twenty-five children show after the first taste of failure a mean drop greatly in excess of the range of the mean scores of the next six trials. Having rung the bell seven times and received seven gold stars only one week previously, were their expectations too high? Was it a discouraging shock the first time to see the experimenter actually cut out of the paper "ginger-bread boy" one of the pretty red buttons? Chase observed that some of the children failed to take the punishment seriously, some even laughing over it. She feels, herself, that the punishment was not effective and that it may have somewhat distorted the operation of the other motivational factors.

The graphs in Figure 1 seem consistent with the general findings of Chase with perhaps two exceptions related to Groups B, C, and D.

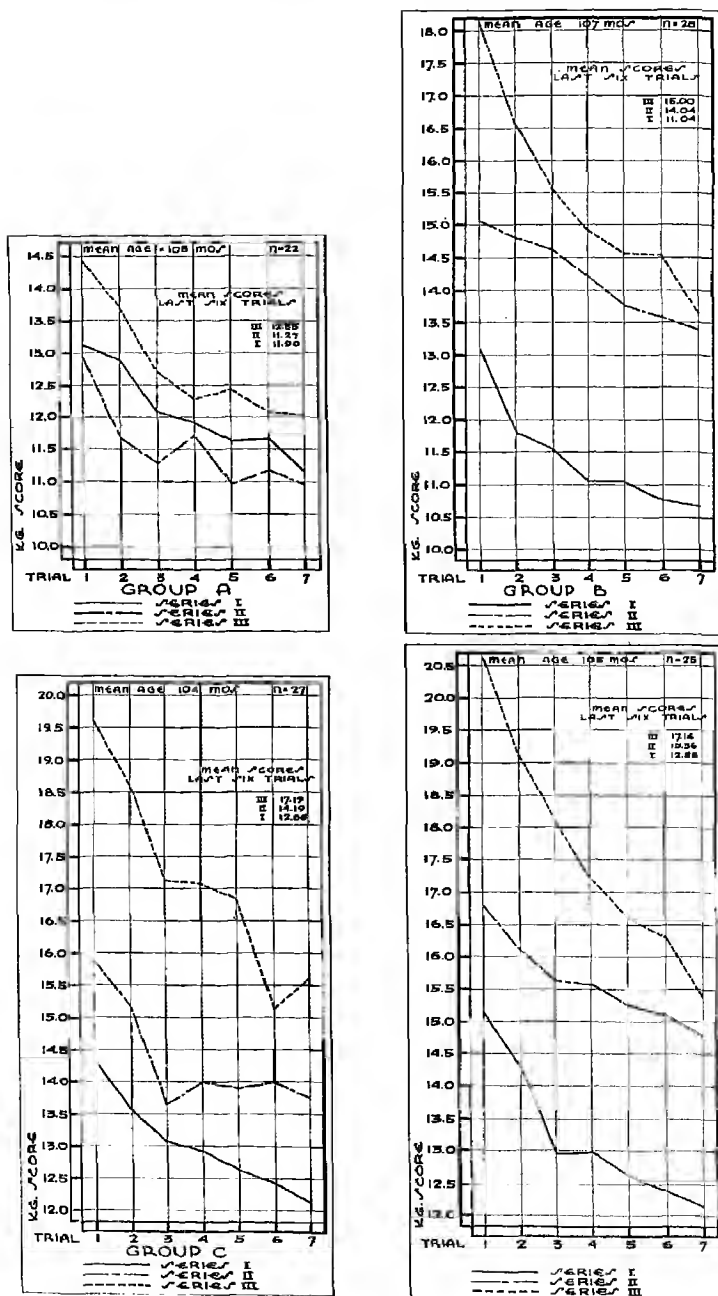


Figure 2
 Graphs of Mean Trial Scores for Each of the Seven Trials for All Subjects by Series in Groups A, B, C, D, for the 102 Smith Re-test Subjects.

1. The possibility of a definite goal to strive for in Series II accounts for the fact that initial trials in Series II are in all cases higher than initial trials with an unknown goal (Series I). Only after the first trial in Series II does the factor of success begin to operate with the accompanying factors of repetition of instructions, praise, and reward in the respective groups.

2. The superiority of Series III over Series II should be explained not as due to the finding that failure was a stronger motivation than success, but as due to a complex set of forces of which failure is only one. The initial trial of Series III for Groups B, C, and D was superior to anything achieved under success motivation; yet in each case it was performed before the child became aware of failure. This superior performance cannot therefore be explained by failure.

Chase has suggested the reason, borne out by the observations of Anderson and Smith, that the "train system" for informing the child of failure was more interesting to the children than was the "water system" for giving visual knowledge of success.

Another factor is probably the fact of success one week previously including the various social implications of success in the presence of the two adults, the experimenter, and the recorder. It is not to be presumed that in the first trial of Series III it has meant nothing to the child to have rung the bell seven consecutive times only a week before.

An inference not contradicted by any findings and supported by the data is that both success and failure plus greater interest in the water system plus more familiarity with the apparatus and the experimenter plus a greater spontaneity arising out of all these factors contributed to making the mean group scores of Series III significantly greater than those of Series II, except in Group D when reward and punishment were used and the difference approached significance.

The retests of these 102 children although showing general tendencies similar to those reported by Chase, do not show quite the same tendencies when the mean group scores are computed for each successive trial. See Figure 2.

In Series I, control motivation, the curves for all four groups, A, B, C, and D, not only begin within a fairly comparable range but as in the Chase data show similar tendencies through the seven trials.

In Group A none of the mean group differences are significant, although something operated to make the scores the third week reverse the position in the Chase data and exceed the scores for both Series I and Series II. With one exception the probable errors of the differences in all the retest data are higher than in the data obtained by Chase.

Group B had success and failure accompanied by a repetition of instructions. Success and failure are each significantly greater than no goal motivation in Series I. But failure is not significantly greater here than success, although the mean trial scores for failure are each higher than the mean corresponding scores for success. The pitch of the two curves if extrapolated to one more trial would show failure actually dropping below the success curve. The lack of significant difference between success and failure plus the steep drop of the failure curve cannot support a conclusion that failure with repetition of instruction is greater motivation than success with repetition of instructions. These facts would lead rather to the conclusion that the "greater interest in the train system" was disappearing fast.

The inference is that some other factors operated to produce a higher initial performance the third week and that failure operated even less than success to sustain initial effort against a waning interest and fatigue.

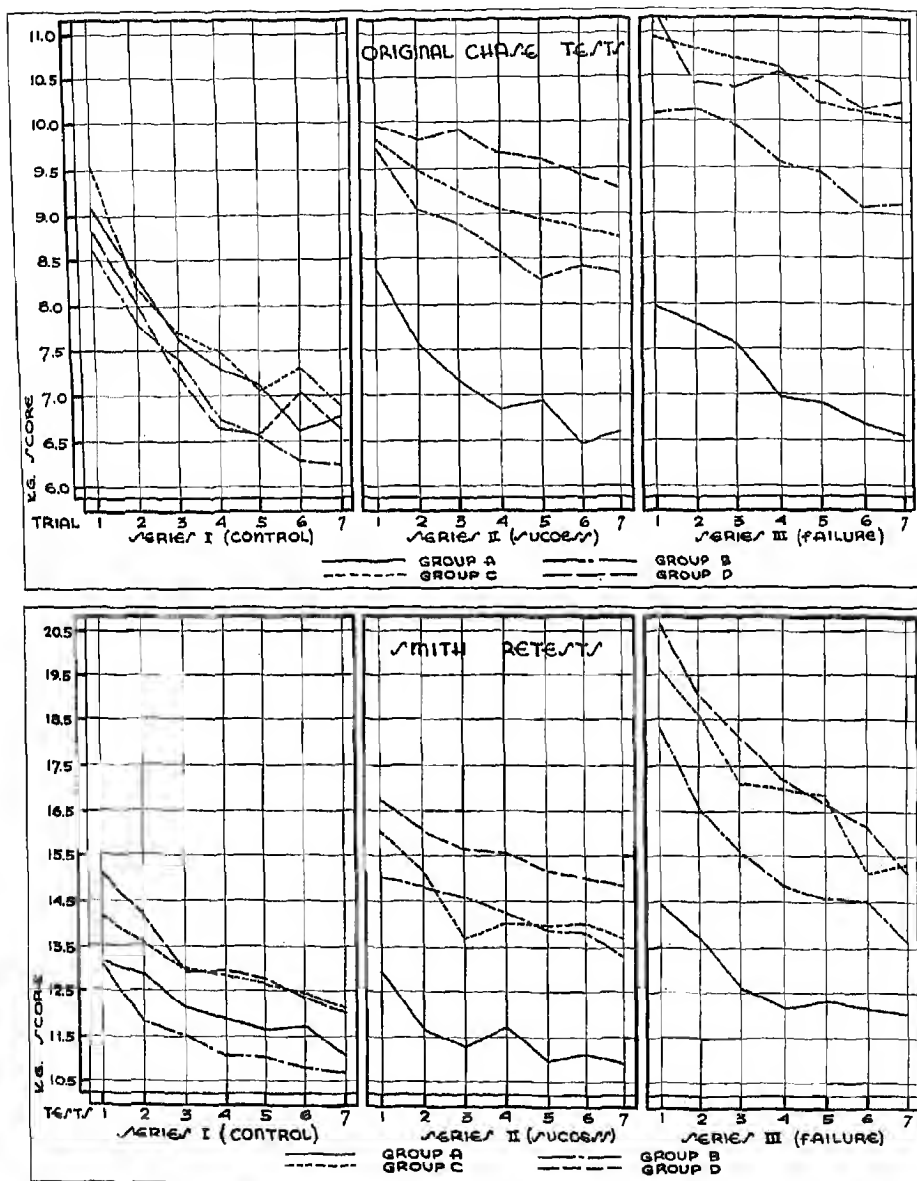


Figure 3

Graphs of Mean Trial scores for Each of the Seven Trials for 102 Subjects by Series in Motivation Groups A, B, C, D showing Original Chase Tests and Smith Rereads.

Group C received praise with success and reproof with failure. The initial trial in Series II is sufficiently greater to add confirming evidence that a definite goal is better motivation than an indefinite goal. The evidence is against the possibility that on this trial the factors of practice and familiarity may also be operating. It has been seen that Groups A in both Chase and Smith data show that the first trial one week after control motivation produced in both the original test and the retest mean scores lower than the initial trial score the first week. In Series III of Group C the initial trial is again far above any other score. Failure as a psychological factor does not begin to operate until after the first trial. Although significantly greater than success in mean group score comparisons, after the first taste of failure the performance drops at a much swifter pace than the rate of drop for success.

In Group D all mean group score differences between series are significant, the difference between success and control motivation being over twenty times its probable error. The same tendencies as found in Groups B and C can be seen in the directions of the curves.

It might be mentioned as a further explanation of the steep drop of the failure curves in Groups B, C, and D that with so much greater effort on the initial or early trials it is to be expected that fatigue will appear more quickly. The tendencies of the different curves beyond the seventh trial are unknown. Some children reported sore hands after the seventh trial, for which reason it is not clear that extrapolation beyond the seventh trial is justified.

Figure 3 shows the curves of mean trial scores for Chase and Smith tests assembled so as to compare groups on each series. The curves for both the original Chase tests and the Smith retests are plotted from performances by the same children retested after an interval of three years. Control motivation is more uniform in the younger ages as tested by Chase than in the same children when tested by Smith. It is not probable that differences in experimenters or in test situations account for the different tendencies shown between the Chase and Smith data. The precautions which were taken to make the retest uniformly like the original test have been discussed elsewhere by Anderson and Smith.

AGE PERFORMANCE OF 100 BOYS GIVEN SUCCESS WITH PRAISE AND FAILURE WITH REPROOF

Of the twenty-seven boys in the original Chase Motivation Group C, eighteen were available three years later for retest by Smith. Since the retest showed general mean tendencies similar to those reported by Chase, it was felt that these retest boys could be counted as new subjects. To this number of forty-five it was hoped to add a sufficient number of new boys to make four age groups of twenty-five each. One hundred cases were obtained⁴, but due to absences and other difficulties in getting children for three consecutive weekly tests the age distribution appeared as given in Table 3. Age is calculated to the nearest birthday.

Table 3 gives for the respective series the mean scores⁵ and probable errors of the mean and standard deviations for age groups and for the entire group of 100 boys.

Figure 4 shows graphically the mean scores presented in Table 3. It can be seen not only that the age groups increase their performance as the boys grow older, irrespective of the motivation offered, but also that this increase is

⁴ The writer was assisted in this study and in study discussed in Part III of this report by Ruth S. Smith, a graduate student who gave the tests, and by Harold S. Carlson, Research Assistant at the Iowa Child Welfare Research Station, who served as recorder.

⁵ The term scores is taken to be based on trials two to seven inclusive unless indicated in the text that it is a mean of group performance on one trial.

proceeding at an increasing rate.

TABLE 3

Mean Scores in Kilograms for Trials Two to Seven Inclusive, Standard Deviations, and Probable Errors by Age Groups and Series for 100 Boys in Motivation Group C

Age, Years	Number	Series I			Series II			Series III		
		Mean	Stand-ard De-viation	Probable Error of Mean	Mean	Stand-ard De-viation	Probable Error of Mean	Mean	Stand-ard De-viation	Probable Error of Mean
5	13	7.2	1.24	.23	9.2	1.96	.37	10.2	1.17	.22
6	28	8.2	2.10	.27	9.9	2.78	.35	11.0	3.11	.40
7	20	9.3	1.87	.28	11.9	2.50	.38	13.2	3.17	.48
8	16	10.8	2.77	.47	12.9	3.00	.51	14.8	2.93	.49
9	13	14.2	3.41	.64	17.0	3.30	.62	18.6	4.44	.83
10	4	12.3	1.46	.49	14.4	1.50	.51	16.2	1.17	.39
11	6	13.1	1.76	.48	16.8	3.45	.95	16.6	4.66	1.28
Total Group	100	9.9	3.2	.22	12.2	3.8	.26	13.5	4.2	.28

These data now add confirming evidence to tendencies seen in comparing Figures 1 and 2 in Part I of this article. In the retest of 102 children after an interval of three years, not only did they show higher kilogram differences in performance but they showed greater variability. There is evidence that performance on a hand dynamometer correlates with weight. Kilogram units of measurement are not fixed units having the same meaning at each age. A kilogram variation at age five is more of a variation than a kilogram at age nine. The use of percentage increases and decreases by Chase and by Anderson and Smith has acted as a correction for this elastic tendency in the measuring stick. In making mean group score comparisons between different kinds of motivation, it is necessary that the factors related to the increasing rate in older boys be kept comparable in the groups.

In computing the probable errors of the difference between mean scores, the following formula for correlated measures was taken from Holzinger.⁶

$$P.E.M_2 = \sqrt{(P.E.M_1)^2 + (P.E.M_2)^2 - 2r_{12}P.E.M_1P.E.M_2}$$

In order to use this formula, correlations were obtained and are given here in Table 4 even though the numbers are small.

TABLE 4

Correlations* Between Series by Age Groups for 100 Boys in Motivation Group C

Age, Years	Number	Series I and II		Series II and III		Series I and III	
		r	P.E.r	r	P.E.r	r	P.E.r
5	13	.75	.09	.78	.08	.62	.12
6	28	.75	.06	.78	.05	.79	.05
7	20	.81	.05	.61	.10	.55	.11
8	16	.87	.04	.78	.07	.59	.12
9	13	.86	.05	.79	.08	.91	.03
10	4	-.42	.29	-.62	.22	-.42	.29
11	6	.15	.28	.95	.03	.09	.28
Total Group**	100	.86	.03	.83	.04	.79	.04

*rs for age groups computed by the rank

Difference Formula

**rs for entire group computed by the Seashore Formula.

⁶ Holzinger, Karl J.: Statistical Methods for Students in Education. New York: Ginn, (c. 1928) Pp. viii, 372. (p. 243)

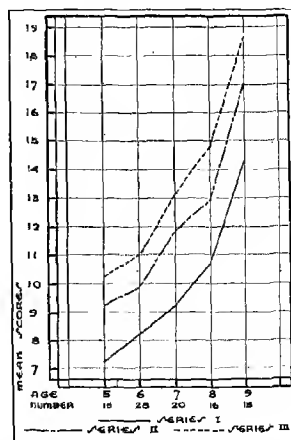


Figure 4.
Graphic Representation of the Mean Scores (of Trials 2 to 7 Inclusive) for Age Groups in Each Series for Boys in Motivation Group C.

The two oldest age groups should be disregarded on account of insufficient cases. Correlations for the other age groups, though less than those found in the Chase study, do not compare unfavorably with those obtained from the Smith retest data. When correlations are computed for the entire group, they are still somewhat under those for the Chase data but are superior to those from the retests. These comparisons are mentioned because in the two preceding studies the correlations were used as one of the methods for establishing reliability of the tests.

Table 5 gives for age groups and for the entire group the comparisons of mean scores by series showing the obtained differences, the probable errors of the differences, and the critical ratios.

TABLE 5
Differences, Probable Errors, and Critical Ratios Between Mean Scores for Series by Age Groups for 100 Boys in Motivation Group C

Age, Years	Number	Series I and II			Series II and III			Series II and III		
		Difference	Probable Error of Difference*	Critical Ratio	Difference	Probable Error of Difference*	Critical Ratio	Difference	Probable Error of Difference*	Critical Ratio
5	13	2.0	.25	8.0	1.0	.24	4.1	3.0	.20	15.0
6	28	1.7	.23	7.4	1.1	.25	4.4	2.8	.25	11.2
7	20	2.6	.23	11.2	1.3	.39	3.3	3.9	.40	9.7
8	16	2.1	.25	8.4	1.9	.33	5.7	4.0	.44	9.0
9	13	2.8	.33	8.5	1.6	.52	3.0	4.4	.42	10.5
10	4	2.1	.54	3.8	1.8	.41	4.4	3.9	.48	8.0
11	6	3.7	1.00	3.7	.2**	.48	.4	3.5	1.14	3.0
Total Group	100	2.3	.13	18.0	1.28	.16	8.0	3.58	.18	20.0

* Formula for correlated measures.

** In all cases means for Series II are greater than means for Series I; III is greater than II, with this one exception, and III is greater than I.

In the five youngest age groups comprising ages 5, 6, 7, 8, and 9, the differences between mean scores are not only consistently in the same direction, but, with two exceptions, and in spite of small numbers, the differences are significant. The two exceptions approach significance.

Chase stated that "because of the limited number of cases in each test group it is not possible to draw any conclusions as to the relationship between either age or sex and motivation as given in this study." (Chase, p. 102) She did find, however, "a tendency for a greater percentage of younger subjects to increase their scores in Series II and III over Series I than for older subjects." (p. 99) By way of explanation Chase adds: "Just what factors are operating to inhibit the initial performance of the younger children is not clear. It may be that the younger child needs more motivation in comparison with the older child for effective performance than that given in the control-motivation series. A more probable factor is that physiological age or conditions are in some way accounting for the lower performance on this initial test. An older child may be able to adjust his hand and arm muscles to the apparatus much more effectively than the younger child because of better coordination and thus better symmetry of action." (Chase, p. 99)

The data obtained from these 100 boys were further analyzed to yield mean trial scores for the respective age groups and for the entire group. These mean trial scores have been plotted graphically and are given in Figure 5. Graphs are omitted for the two highest age groups, which together have only ten children. It might be pointed out again that all the differences between mean group scores for the second to the seventh trials inclusive were significant.

For the group taken as a whole, the critical ratios of these differences are in round numbers 8, 18, and 20 for the three comparisons.

In the graphs in Figure 5 can be seen the same tendencies pointed out in Part I of this report comparing 102 children with their own scores three years later.

Control motivation curves for mean trial scores in Series I seem to hold to essentially the same form and to extend through approximately the same range irrespective of age.

Success curves tend more to sustain effort through the successive trials, though the tendency in absolute scores is slightly less in the older boys. In the two youngest groups, failure curves tend to parallel success curves, but as age increases the failure curves tend to fall more than do the success curves.

When the mean trial scores of the entire group of 100 boys are plotted, failure appears not to sustain effort as much as does success. Translating these tendencies into percentage of decrease, comparisons between second and seventh trials do not equate the tendencies. Success motivation scores on the seventh trial decrease approximately 8 per cent, while failure scores decrease 13 per cent.

At all ages the mean scores for initial trials at each successive week show marked increases in effort. This adds supporting evidence to the assumptions (1) that a definite goal is stronger motivation than an indefinite goal and (2) that some factors besides failure are strongly operating in Series III, though they tend to weaken with successive trials.

FAILURE VERSUS SUCCESS

Chase felt that some factors other than failure might be accounting in part for the significantly higher mean failure scores of subjects who received success the second week and failure the third week. She suggested that the train system appeared to be more interesting to the children than the water system and that the fact of success one week previously might be contributing to the failure motivation.

An attempt was made to study the second of these factors by holding constant all procedures in Group C motivation except the order of success and failure. This order was reversed.

Forty-four children were given the regular control motivation the first week, failure with reproof on the water system the second week, and success with praise on the train system the third week.⁷

TABLE 6						
Analysis of Group E Subjects in Terms of Age, Months*						
Sex	Children	Age, Years			Mean Age, Months	Age Range, Months
		3	4	5 and 6		
Boys	18	6	8	4	46.1	31 to 66
Girls	26	7	6	13	54.4	32 to 75
Boys and Girls	44	13	14	17	51.0	31 to 75

* Age is calculated to the nearest birthday; e.g., age four includes children between three years, six months and four years, five months.

⁷ This procedure and this group of tests will be referred to as Motivation Group E.

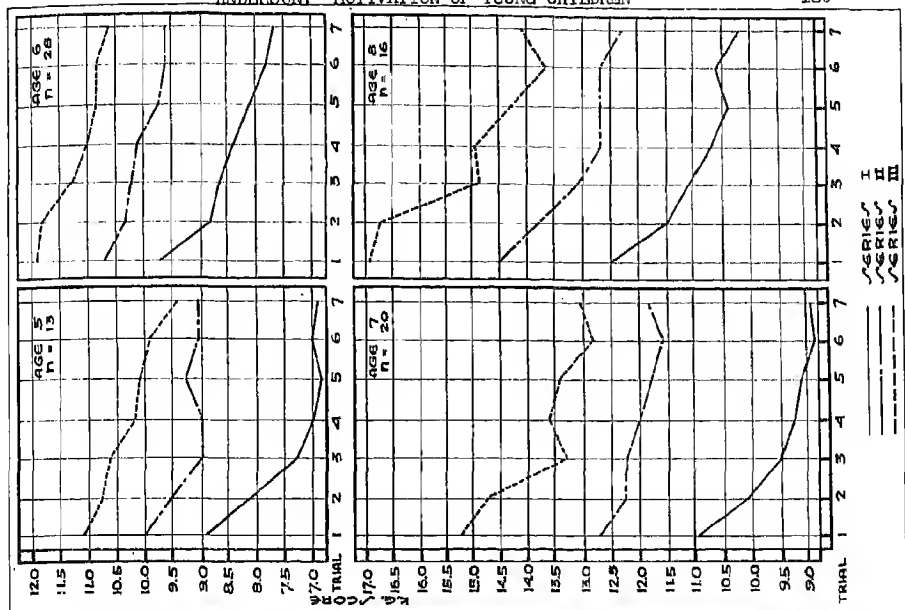
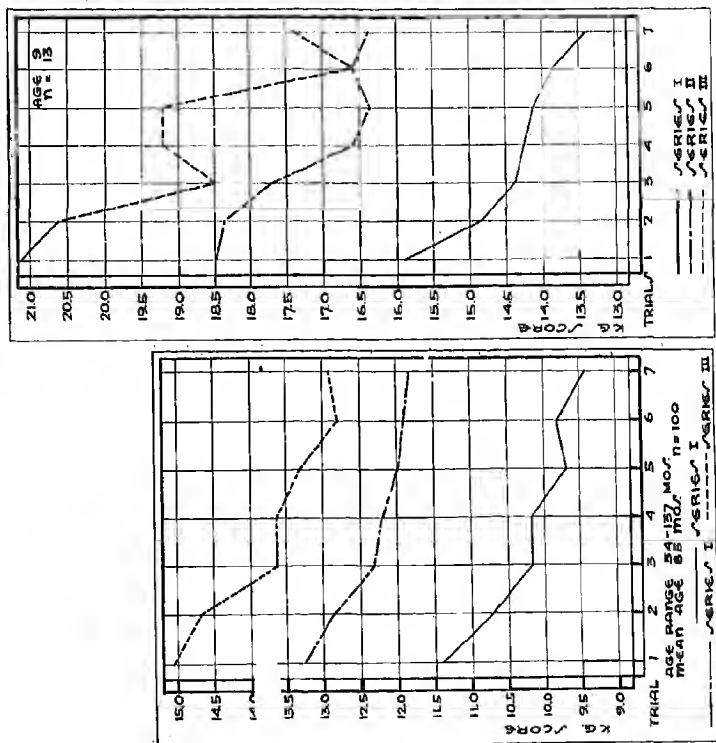


Figure 5
Graphic Representation of the Mean Trial Scores for Each of the Seven
Trials Showing for Age Groups Performance by Series for 100 Boys in
Motivation Group C.



The age and sex distribution together with mean ages and age range in months is given in Table 6. There were eight more girls than boys, and the mean age and upper limit of the age range was somewhat greater for girls than for boys.

Table 7 gives by series the mean scores in kilograms, the probable errors of the mean, and the standard deviations and probable errors of the standard deviations for the forty-four subjects.

TABLE 7
Mean and Standard Deviation of Scores in Kilograms
for Trials 2 to 7 by Series for the Forty-Four Group
E Subjects

Series	Sub- jects	Mean	Probable Error of Mean	Stand- ard De- viation	Probable Error of Standard Deviation
E ₁	44	4.28	.17	1.65	.12
E ₂	44	4.89	.12	1.20	.09
E ₃	44	6.60	.20	1.99	.14

In order to compare the differences between the mean scores by series, the same formula for probable error of the difference for correlated measures as given on page 136 was used. The correlations together with the probable errors of the correlations between the series were as follows:

Series (N = 44)	r	P.E. _r
I and II	.74	.05
II and III	.71	.05
I and III	.50	.07

Table 8 compares performance between the series showing differences, probable errors of the differences, and critical ratios for differences between the mean scores and the standard deviations. The critical ratios for mean differences between the series are decisive. Failure-reproof motivation is still significantly different from control-motivation. Likewise success-praise motivation, as given in this study, continues to be a significantly greater motivation than control-motivation. When, however, the order of success-praise, followed a week later by failure-reproof motivation, is reversed, failure-reproof is no longer significantly superior to success-praise as found by Chase and as confirmed on retests by Anderson and Smith. On the contrary, success-praise when given one week after failure-reproof is significantly superior to failure-reproof. The critical ratio is 11.96 which is slightly above the critical ratio of 8.85 in the reverse order reported by Chase.

TABLE 8
Reliability of Differences of Means and Standard Deviations
Between Series for the Forty-Four Group E Subjects.

Series	Mean			Standard Deviation		
	Mean Differ- ence	Probable Error of Differ- ence	Critical Ratio	Standard Deviation of Dif- ference	Probable Error of Differ- ence	Critical Ratio
I and II*	.61	.115	5.30	.45	.08	5.6
II and III*	1.71	.143	11.96	-.79	.10	7.9
I and III*	2.32	.187	12.40	-.34	.13	2.6

* Indicates the series with the greater mean score.

This leaves unmistakably the conclusion that factors other than failure were affecting performance on Series III in the Chase Motivation Group C procedure. These findings do not justify the assumption, however, that it is the same factor which have been responsible for the reversal in superiority in Motivation Group E procedure. It is still possible that the train system holds more interest for the child and affects his performance accordingly, but it is probable that the change in procedure which converted Motivation Group C into Motivation Group E has entirely changed the situation in which the child is placed and that the reversal of the position of superior motivation is due in considerable part to the differences in the situations.

Two procedures have been followed for studying the effect of the procedure in Motivation Group E on the tendency to maintain the initial performance in the succeeding trials. One was to determine the percentages of children who decreased the scores 25 per cent or more on the last trial over the second trial, who decreased less than 25 per cent on the last trial over the second trial, and who remained the same or increased on the last trial over the second trial. The numbers and percentages of children are given in Table 9.

TABLE 9

Percentages of Children Who Decreased Their Scores 25 Per Cent or More on the Last Trial Over Trial 2, Who Decreased Less Than 25 Per Cent on the Last Trial Over Trial 2, and Who Remained the Same or Increased on Last Trial Over 2, for Motivation Group E

Series	Decreased 25 Per Cent or More		Decreased Less Than 25 Per Cent		Scores Re- mained Same or Increased	
	Num- ber	Per Cent	Num- ber	Per Cent	Num- ber	Per Cent
E1	2	4.5	31	70.5	11	25.0
E2	2	4.5	23	52.3	19	43.2
E3	0	0.0	34	77.3	10	22.7

This table may be compared with data reported by Chase (p. 87) for her Motivation Group C having fifty-three subjects. She found that from two-thirds to slightly over three-fourths of her subjects decreased their scores, whereas from 18 to 30 per cent increased them. The percentages of the Chase Group C whose scores remained the same on the three series was very small.

The Chase group shows a small though steady decline in the number of children whose scores decreased, the percentages from Series I, II, and III being respectively in round numbers 77, 75, and 68. In Group E the percentages of children decreasing in the same serial order are in round numbers 75, 57, and 77. The percentages given in Table 9, to the extent that they can indicate tendencies to maintain efficiency of effort on the initial trial, would lead to the inference that failure operates more strongly than success in maintaining such efficiency in Group E. The Chase data for Group C also indicate a superior tendency for failure to maintain the efficiency of the initial trial.

The other method for studying the effect of motivation on maintaining efficiency was to calculate mean group trial scores for the successive trials. These mean trial scores are given in Table 10 and are reproduced graphically in Figure 6.

The curve of mean trial performance on control-motivation in Series I is different in pattern and range from any other motivation curve obtained from a control group. The curves for failure and for success are also more regular and more horizontal than any other such curves plotted for this report.

TABLE 10

Mean Group Trial Scores in Kilograms for Group E

Series	Trial						
	1	2	3	4	5	6	7
I	4.47	4.38	4.68	4.37	4.18	4.22	4.14
II	5.04	4.97	4.89	4.83	4.87	4.90	4.95
III	6.78	6.78	6.72	6.57	6.50	6.51	6.50

The horizontal tendencies of both success and failure curves may be explained in part by the ages of the children in Group E. It was seen in Figure 5 that the younger children tend to show both success and failure curves that are more horizontal in kilogram units than the success and failure curves for older boys.

Figure 6 shows also that according to the mean initial trial in Series II a definite goal seems to evoke more effort than no goal. The initial trial in Series III, like the initial trial in those other motivation groups in Series III which have a definite goal, is relatively much higher than any other score previously made; this in spite of the fact that forty-four children had each failed to ring the bell on seven successive trials only one week previously. This would seem to be unmistakable evidence that in these data for Motivation Group E some factors other than success and praise are operating to influence achievement in Series III. Perhaps the reason for this lies after all in the greater interest which the children showed in the train system. This is the next factor to be investigated.

SUMMARY AND CONCLUSIONS

This report gives further light on the study of motivation of young children begun by Chase with a hand-dynamometer as the chief measuring tool. While a retest of 102 of the children after an interval of three years showed comparable group tendencies (Anderson and Smith), this report adds the following conclusions to those previously found.

Trends of Effort on Successive Trials by a Re-Analysis of the Data of Chase and of Smith on the 102 Children Available for a Retest.

A re-analysis of the scores giving group mean scores for each trial on the original Chase data and the Smith retest data for 102 children in the four motivation groups showed the following facts:

1. Irrespective of success or failure, a definite goal with the possibility of knowing the results of one's efforts evoked more effort than an indefinite goal which did not offer knowledge of results.
2. Other factors besides failure are known to be affecting the performance of children in the failure series. In Series III the mean scores on initial trials in Groups B, C, and D are in all cases higher than the mean scores of any other trial in any group or series in the original test or the retest data. These highest performances occurred in the failure series immediately before failure was introduced.
3. Contrary to Chase's findings, which were confirmed from her own data by these analyses, the retests of the children showed that failure motivation did not "tend to more nearly maintain initial efficiency" when compared with control motivation. In fact, the initial efficiency was maintained much better by success, while the performance under failure conditions showed a precipitate drop such as would be expected under either a swift onset of fatigue or a quickly waning interest.

Age Performance of 100 Boys Given Success With Praise and Failure With Re-proof.

A study of the performance of 100 boys divided into age groups in Motivation Group C where they were given successively control motivation, success with praise, and failure with reproof warrants the following conclusions:

1. As age increases, boys tend in all three types of motivation situations to expend effort at an increasing rate.
2. As age increases, the motivation in Series III seems to be less effective in maintaining initial effort during the seven trials.
3. In control motivation age seems to have little effect on the tendency to maintain initial effort.
4. The data on the entire group lend evidence to support the conclusions (1) that a definite goal is a stronger motivation than an indefinite goal and (2) that some factor or factors besides failure are affecting the performance in Series III.

Failure Versus Success

The procedure of the Chase Motivation Group C was repeated on forty-four new subjects with the exception that the order of success with praise followed by failure with reproof was reversed. This motivation procedure is referred to as Motivation Group E. The following conclusions are supported by the data:

1. The findings of Chase for Group C are now reversed. In Group E success-praise is a significantly greater motivation than failure-reproof. That is, whether success precedes failure or failure precedes success in these two groups, the performance of the children on the third week is significantly greater than the performance on either the first or second weeks.

2. Either success or failure whether preceded or followed by the other is significantly greater than the control motivation.

3. There is evidence that some factor or factors other than success-praise are considerably affecting the performance of the children on Series III of Group E.

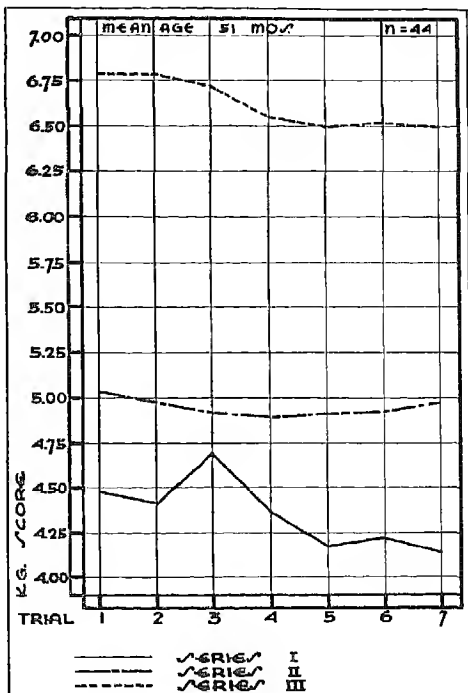


Figure 6.
Mean Trial Scores in Kilograms for Each of the Seven Trials
by Series for the Forty-four Group E Subjects.

THE DEVELOPMENT OF CONCEPTS A STUDY OF CHILDREN'S DRAWINGS

SINA M. MOTT¹

It is the purpose of this study to present a summary of an investigation concerning the relationship between the formation of concepts and the child's overt behavior.

HISTORICAL SURVEY

The Atomists (16) in 420 B.C. led by Leucippus and his disciple Democritus, held - by theory - that all material for the development of concepts passed through the channel of the senses. The concepts, themselves, were not the reality but they were the impressions of the reality coming to the individual by means of the sensations. According to Plato, however, the material for the building of the concepts might come from either the senses or from reason; in fact he held more valuable those which came by the messenger of the gods - reason. By 1690 we find John Locke (9) denying the existence of innate ideas and introducing his "clean sheet" concept of the mind.

The laws governing the mental organization of this material were formulated by Aristotle in his monumental work of the Organon. These laws which were later termed laws of association were attacked by William Wundt (17) of Germany and William James (6) of United States. The theory that they become associated by means of the S-R bonds (15) is now being shown refuted by the work of Lashley (8) and Dunlap (4). While the work of Pavlov (12) throws much light on the more simple mental processes the work of Lashley shows that the complexity of the function of the brain is greater than this simple theory permits. The recent experiments of Coghill (3), Carmichael (2), and Koffka (7) substantiate the idea that development progresses from the whole to the part - from a vague impression of the undifferentiated total to the emergence of discrete elements. The question then arises what is the relationship between these developing concepts and the overt expression. To determine this we turn to a study of the relationship of an idea portrayed in the child's drawing and the overt expression of this same idea.

It has been found by such workers as Ricci (13), Passey (11), Barnes (1), Lukens (10) and Sully (14) that drawings made by children between the ages of about four and eight years are "knowledge" drawings. That is they are a description of the object according as the impression of it is more or less clear in the child's mind. Drawings made by the children of this period then make excellent material for the study of the development of concepts.

THE METHOD

The method used in this investigation partook of the nature of the latitudinal in that it was a study of the drawings of 138 children - 562 drawings. Not only were the drawings made by these children studied but also the results of: 1) three mental tests - Pintner-Cunningham Primary Mental Test, The Porteus Maze and the Goodenough Scale for Measurement of Intelligence by Drawing - 2) Two personality tests - Marston's "Personality Rating Scale" and Rogers' "A Test for Personality Adjustment" - 3) three muscle coordination tests by Franz and 4) two drawing tests - Thorndike Scale for General Merit of Children's Drawings and the Kline-Carey Measuring Scale for Freehand Drawing. But this investigation differed from the usual latitudinal method in that the drawings were considered in relationship to the child who drew them. The first 101 made three drawings apiece and the last thirty-seven drew seven. On the sheet on which the child made his drawing were recorded the name of the child, the time taken to draw the picture together with the name of the person and the object drawn. Thus this investigation partook of the nature of the intensive study in that it was interested in

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the drawings of the individual child in relationship to his personality and it was extensive in that it covered a sufficient number to warrant the use of the statistical methods.

THE ORDER FOR COLLECTING THE MATERIAL

The material was collected in the order of: 1) call for the picture,

To-day we are going to draw a picture of a person. It may be any person that you choose. Draw the very best one that you can. Take all the time that you wish. When you are done raise your hand that we may know that you are through and may take up the paper.

As each completed his drawing, the amount of time required to make the picture and the name of the person drawn were recorded on the sheet. This was followed by 2) a group test and then 3) the individual tests. The same procedure was followed on the second day, an alteration being the call for a "man" to be drawn. The third day the call was for a "man and something else."

THE ANALYSIS OF THE DRAWINGS

The analysis of the drawings involved: the study of the lines used in drawing the picture, the ratio of the length to the width and of the head to the other parts of the body, the insertion of different elements, the time required to make the drawings, the number of different objects added, the activity portrayed, and the portrayal of an awareness of one's environment.

THE SCALE

The five items: the time taken to draw the picture, ratio of the length to the width, the number of additional objects, the portrayal of activity, and the portrayal of an awareness of one's environment became the basis for the construction of a scale. It was found that the first three items fitted readily into five point scales, the sorting technique was employed for the last two items. Each of the three sets of drawings were handed to five different graduate students to sort into five piles: 1) activity portrayed in(A) arms and(B) legs; and 2) awareness of one's environment as to(C) dress and(D) type of activity. The directions given for the sorting of the pictures for activity in the arms were:

You are asked to consider only the activity portrayed in the arms. After discarding all the pictures in which there are no arms drawn, sort the remaining ones into five piles - No. 1 no activity portrayed No. 5 the portrayal of the greatest amount of activity. Make as many alterations as you wish until you are satisfied with the position assigned to each drawing.

Those pictures in which there was a complete agreement as to the place in the five point scale were selected as the pattern for that place. Two pictures were then pulled from each of the five places, mounted on a sheet and photostated. They thus became the scale for measuring the portrayal of activity as expressed in the arms. The same procedure was followed for the other three factors.

Thus, inasmuch as these were "knowledge" pictures, it may be said that insofar as this scale measured the number of additional objects, the activity portrayed, the proportion of one part to another, and the awareness of one's environment, it measured: the association (or suggestibility), the concept of proportion, the activity concept, and the awareness of one's environment, which were a part of the child's knowledge. In other words, the scale measured by use of a mirror - the drawings - these concepts.

THE FINDINGS

Upon completing the construction of the scale it was used by five other graduate students in rating the pictures. Table 1 contains the coefficients obtained by comparing the scores on the various parts of the scale and also the coefficients obtained by comparing the combined score on the scale with the scores on the other tests and scales. The coefficient of .664 which these scores have with the scores on the Marston Scale is more clearly understood when the scales for the five factors are paralleled with the statements on the Marston Scale.

TABLE 1
COEFFICIENTS OF CORRELATION

Element Compared with other factors	r	P.E.
<u>Additional objects</u>		
1. Activity expressed in the arms. . . . .	.366	-.065
2. Activity expressed in the legs. . . . .	.563	.061
3. Awareness of one's environment - activity . . . . .	.484	.064
<u>Activity expressed in the legs</u>		
1. Activity expressed in the arms. . . . .	.735	.033
2. Awareness of one's environment - activity . . . . .	.624	.043
3. Awareness of one's environment - dress. . . . .	.537	.050
4. Ratio of length width . . . . .	.373	.062
<u>Awareness of one's environment</u>		
1. Activity compared with dress. . . . .	.659	.039
<u>Combined score on activity expressed in arms and legs</u>		
1. Time taken to draw the picture. . . . .	.521	.049
2. Scores on questions 3 and 13 of Marston Scale . . . . .	.479	.052
<u>Scores on the Scale</u>		
1. Chronological age . . . . .	.501	.050
2. I.Q. (Pintner-Cunningham) . . . . .	.261	.063
3. I.Q. (Goodenough) . . . . .	.244	.063
4. Rogers' Personality Adjustment.	-.059	.068
5. Thorndike Scale . . . . .	.564	.046
6. Scores on the Marston Scale . . . . .	.664	.037
<u>Chronological age</u>		
1. Thorndike Scale . . . . .	.511	.050
2. Scores on the Marston Scale . . . . .	.021	.066

This coefficient is all the more significant when compared with the coefficient .021 which the scores on the Marston Scale have with the chronological age. It would therefore appear that there is a definite relationship between the overt expression of the personality traits (quickness to respond to a situation, participation in activities, association with others and an awareness of one's environment) which are measured by the Marston Scale and those same traits as measured by the scale. This means that there is a definite relationship between the concept of a personality trait and the overt expression of that same trait.

VALIDATING THE FINDINGS

Inasmuch as the drawings were measured by the scale which had been constructed by the use of these same drawings the results thus obtained were checked by investigating a new group of children. The only alterations in the procedure were:

1. Every child held his paper thirteen minutes, but the time used in drawing the person was recorded on the sheet.
2. Four additional pictures were called for: a person and something else, an Indian, policeman and cowboy.

TABLE 2

THE SCORES ON THE SCALE COMPARED WITH THE SCORES
ON THE OTHER TESTS AND SCALES

Scales	r	P.E.
1. Chronological age. . . . .	.486	-.066
2. I.Q. (Pintner-Cunningham). . . . .	.440	.066
3. I.Q. (Goodenough). . . . .	.542	.065
4. Thorndike Scale. . . . .	.643	.065
5. Scores on the Marston Scale. . . . .	.769	.063

Table 2 presents the coefficients which show the relationships existing between the scores on the scale and the scores on the other scales and tests.

THE SIGNIFICANT ASPECTS OF THE STUDY

Perhaps the most significant element in the study is the attempt to investigate the development of concepts in their relation to the personality traits of the child. It has often been said that the blacksmith sees the world through a horseshoe and the cobbler through the sole of a boot but just what relationship existed between the concept formation and the overt behavior of the child had not been definitely studied.

It was noted that the child who portrayed activity in respect to the "man" and the "person" also portrayed activity in respect to the "cowboy", the "Indian" and the "policeman" as well as animals such as dogs, horses and chickens. Thus it is seen that the general activity pattern was so well established as to act as a controlling factor in the building of new concepts. Using a different figure of speech, it would seem that it acted as a guide light so that the child saw the world, in general, as an active world.

The fact that there is a coefficient of correlation of .769 (-.063) between the portrayal of activity, the tendency to associate with others and an awareness of one's environment in the concepts and the overt expression of these same traits would lead one to ask: Is the concept the result of the overt behavior, is the overt behavior the expression of the concept or may they both be the result of something else?

REFERENCES

- (1) Barnes, E.: Notes on children's drawings. Ped. Sem. 1891, 1, and 1893, 2.
- (2) Carmichael, L.: Development of behavior on vertebrates experimentally removed from the influence of external stimulation. Psychol. Rev. 1926, 33, 51-58, and 1927, 34, 34-47.
- (3) Coghill, G.E.: The early development of behavior in 'Amblystoma' and in man. Arch. Neur. and Psychiat. 1929, 21, 989-1009.
- (4) Dunlap, K.: Habits, their making and unmaking. New York, Liveright, 1932, pp. 58.

- (5) Fletcher, J.M.: Psychology in education. New York, Doubleday Doran, 1934, and Cubberly, E.P.: History of Education, New York, Houghton Mifflin Co., 1920, pp. 390.
- (6) James, W.: Talks to teachers, New York, Holt, 1914.
- (7) Koffka, K.: Growth of the mind; and introduction to child psychology, (trans. Robert Morris Ogden). New York, Harcourt, 1924, pp. 382.
- (8) Lashley, K.S.: Brain mechanism and intelligence. Chicago, Univ. Chicago Press, 1929, pp. 172-176.
- (9) Locke, J.: Essay concerning human understanding taken from the works of John Locke (V. 1). London, Printed for John Churchill and Samuel Manship, 1914.
- (10) Lukens, H.: A study of children's drawings in early years. Ped. Sem. 1896, 4.
- (11) Passy, J.: Notes sur les dessins d'enfant, Rev. Phil. 1891, 32.
- (12) Pavlov, I.P.: The normal activity and general constitution of the large hemispheres and conditioned reflex, (trans. Anrep) Oxford Univ. Press, 1928.
- (13) Ricci, C.: L'arte dei bambini. Ped. Sem. 1894, 3.
- (14) Sully, J.: Studies in childhood, New York, Appleton, 1908.
- (15) Thorndike, E.L.: Educational psychology, New York, Teachers' College, Columbia Univ. 1913, pp. 23, 25.
- (16) Weber, A.: History of philosophy. New York, Scribner, 1896, pp. 57-58.
- (17) Wundt, W.: An introduction to psychology, (trans. R. Pintner). London, Geo. Allen and Unwin, 1912-1924, pp. 133-172.

INTERPOLATION FORMULAE FOR THE GROWTH OF THE HUMAN BRAIN
AND ITS MAJOR PARTS IN THE FIRST YEAR OF POSTNATAL LIFE

RICHARD E. SCAMMON¹

The general course of the growth curve of the mass of the human brain in post-natal life is fairly well known.

The total brain increases in weight very rapidly after birth through infancy and the early part of childhood, and grows relatively little thereafter. The same observations hold true for the several major parts of the encephalon, although each shows a slightly different fashion of growth than that of the brain as a whole.

Descriptive curves of brain growth from birth to maturity may be represented by a number of expressions, some quite elaborate and some fairly simple. However the brain as a whole and its several major parts increase so rapidly in the first year that straight line expressions for the relationship between masses of these structures and time seem justifiable for practical use in this period. Such straight lines are, in effect, secants of the very abrupt early segments of brain-growth curves that cover the entire postnatal growth period.

It should be pointed out that while these straight line expressions may be safely used for interpolation, they should not be extrapolated to represent the later growth of the brain and that rates and ratios obtained from them are approximate at best.

There are available in this laboratory nearly 1300 records of the observations on the mass of the total brain or encephalon in the first year and nearly 1260 records of the weights of the major brain parts, cerebrum, cerebellum and brain stem. Some of these are in the form of averages but a number are of individual cases. As is the case with practically all records of organ weights, these are drawn largely from a hospital population, although all records indicating any involvement of the brain in disease have been eliminated. Only Caucasian brains are included. Simple empirical formulae have been developed by the method of averages (the points included being birth, first quarter, second quarter and second half of the first year). The results obtained are as follows:

TOTAL BRAIN (ENCEPHALON)

The formulae and graphs for the growth of the total brain (males, females and both sexes) are shown in Figure 1. Table 1 shows the observed and calculated values at birth, for each month and for each quarter. In both the graph and the table it has been assumed (as is necessary because of the grouping of the cases) that the median points of the respective months and quarters represent the average or mean age of the individuals in the group. The first segment of Table 5 shows the

¹ From the Graduate School and the Institute of Child Welfare, University of Minnesota

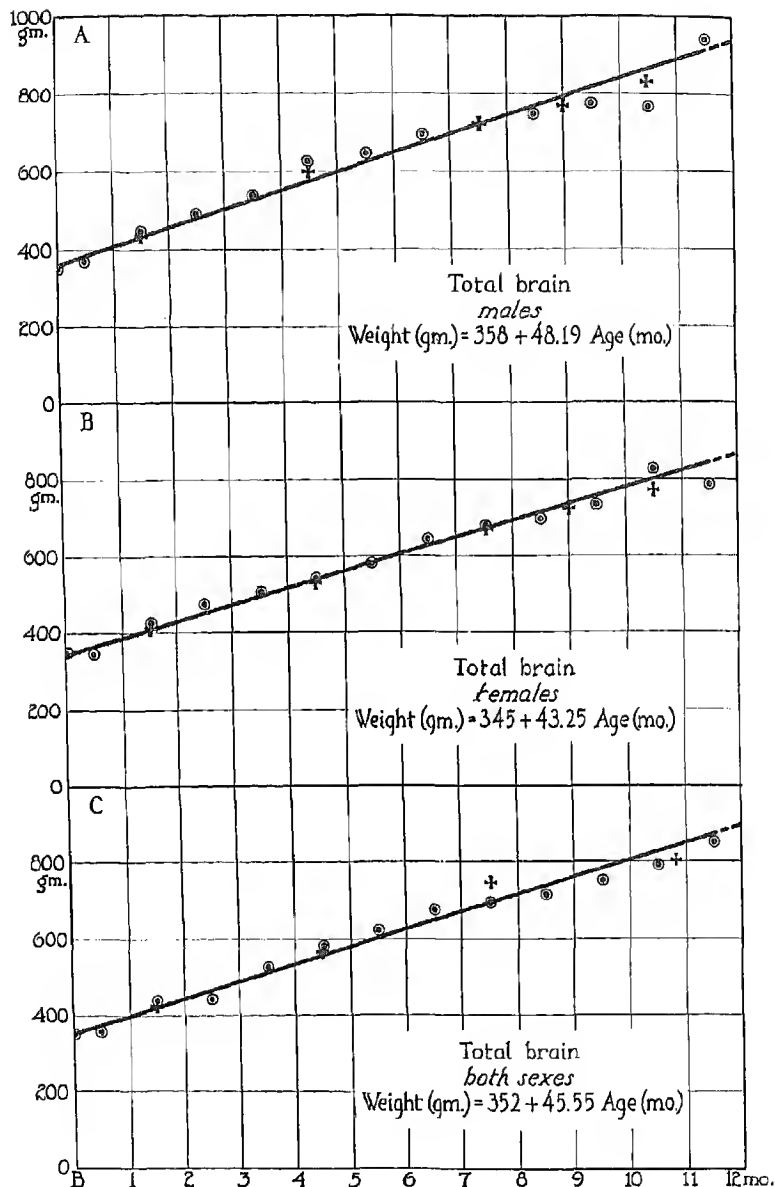


Figure 1. Graphs showing the monthly and quarterly averages of weight of the total brain (encephalon) in the first year of postnatal life. A, males; B, females; C, both sexes. Mean values at birth and for each monthly interval indicated by circled dots. Mean values for quarters (and for the second half-year) indicated by crosses. Lines of central tendency (as represented by the empirical formulae in the panels of the graph) drawn in solid line..

TABLE 1

OBSERVED AND CALCULATED WEIGHT OF THE TOTAL BRAIN
IN THE FIRST YEAR OF POSTNATAL LIFE

Age Range	Males			Females			Both Sexes		
	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)
Birth	137	352.8	358.0	122	346.7	345.0	317	350.7	352.0
<u>Months</u>									
First	117	369.2	382.1	110	350.0	366.6	227	359.9	374.8
Second	69	447.7	430.3	61	423.7	409.9	130	436.4	420.3
Third	82	488.2	478.5	57	471.3	453.1	139	481.2	465.9
Fourth	53	537.7	526.7	50	506.4	496.4	104	523.1	511.4
Fifth	34	625.1	574.9	38	541.0	539.6	72	580.7	557.0
Sixth	41	647.7	623.0	31	584.1	582.9	73	620.6	602.5
Seventh	23	695.4	671.2	24	644.6	626.1	48	670.2	648.1
Eighth	22	714.2	719.4	19	675.3	669.4	41	698.2	693.6
Ninth	17	750.1	787.6	24	696.5	712.6	41	718.7	739.2
Tenth	13	774.2	815.8	17	732.5	755.9	30	750.6	784.7
Eleventh	14	763.9	864.0	13	824.5	799.1	27	793.1	830.3
Twelfth	15	936.8	912.2	17	783.6	842.4	32	855.4	875.8
<u>Quarters</u>									
First	272	435.0	430.3	237	410.5	409.9	535	420.5	420.3
Second	149	599.3	574.9	150	534.3	539.6	299	567.0	557.0
Third	62	715.0	719.4	66	671.8	669.4	130	694.3	693.6
Fourth	42	828.8	864.0	47	776.4	799.1	89	801.2	830.3
Third and Fourth	174	770.0	791.7	167	726.5	734.2	342	748.4	762.0

(All weights calculated to the second and thrown to the first decimal.)

mean residuals (observed minus computed values), absolute and relative, weighted and unweighted by the number of observations, for each of these expressions. As a whole the expressions fit quite well, that for the male brains being the least and that for the female brains being the most satisfactory by all the tests tried.

CEREBRUM (CEREBRAL HEMISPHERES PLUS THE THALAMENCEPHALON)

The graphics of the relation of cerebrum weight to age and the empirical formulae therefor are shown in Figure 2. Table 2 shows the observed and computed values. Inspection of the graph shows that the fits are moderately good, as is indicated also by the measures given in the second division of Table 5. The fit

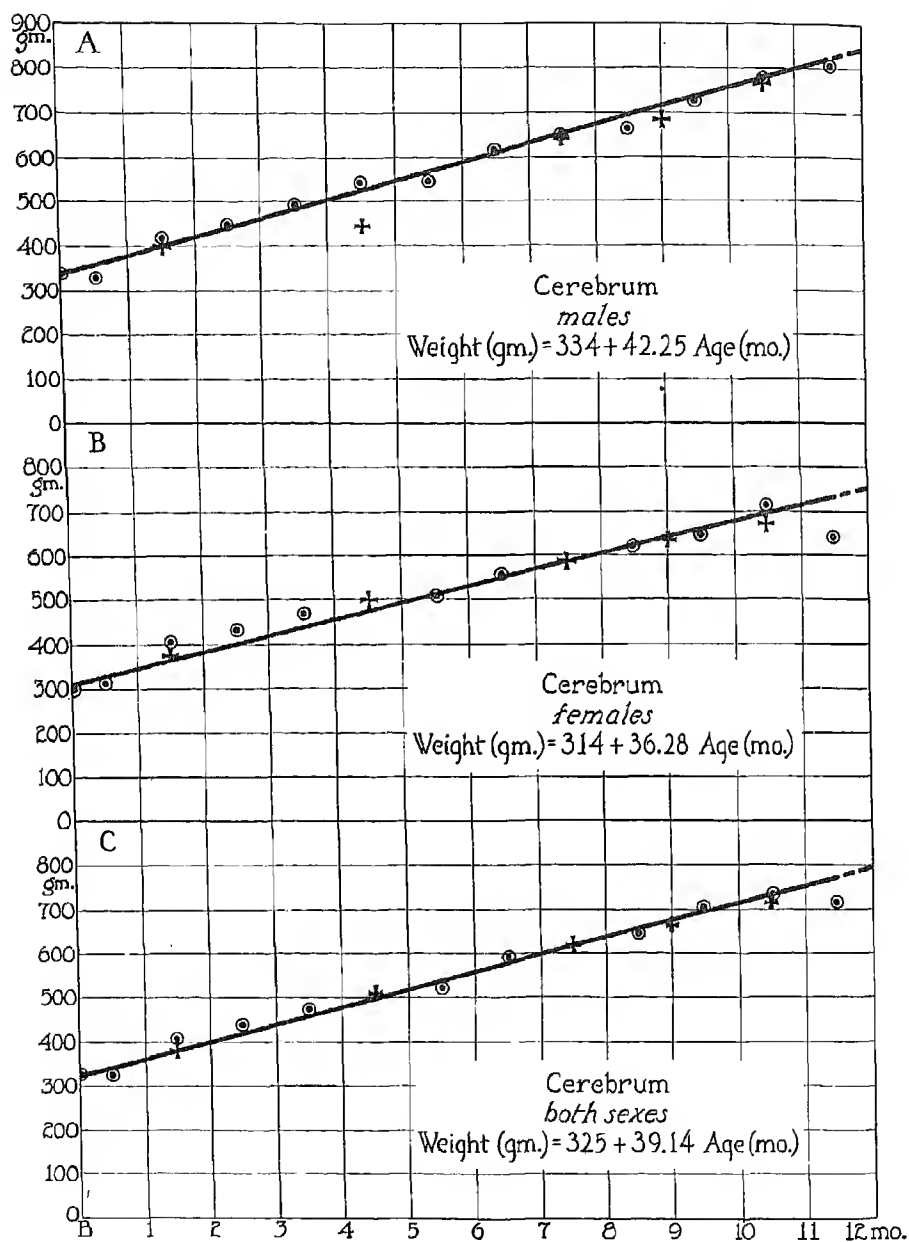


Figure 2. Graphs showing the monthly and quarterly averages of weight of the cerebrum (cerebral hemispheres and thalamencephalon) in the first year of postnatal life. A, males; B, females; C, both sexes. Symbols as in Figure 1.

TABLE 2

OBSERVED AND CALCULATED WEIGHT OF THE CEREBRUM
IN THE FIRST YEAR OF POSTNATAL LIFE

Age Range	Males			Females			Both Sexes		
	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)
Birth	63	337.4	334.0	45	300.2	314.0	108	321.9	325.0
<u>Months</u>									
First	53	332.2	355.1	48	311.7	332.1	101	322.5	344.6
Second	25	415.8	397.4	27	402.8	368.4	52	409.1	383.7
Third	27	449.4	439.6	26	435.6	404.7	53	442.6	422.8
Fourth	12	494.4	481.9	18	466.2	441.0	30	477.5	462.0
Fifth	10	540.2	524.1	13	474.1	477.3	23	502.8	501.1
Sixth	11	544.1	566.4	14	503.9	513.5	25	521.6	540.3
Seventh	9	618.2	608.6	6	556.5	549.8	15	593.5	579.4
Eighth	9	648.9	650.9	5	585.2	586.1	14	626.1	618.6
Ninth	6	668.0	693.1	4	619.5	622.4	10	648.6	657.7
Tenth	4	729.2	735.4	2	647.5	668.6	6	702.0	696.8
Eleventh	2	778.0	777.6	4	713.2	694.9	6	734.8	736.0
Twelfth	4	804.8	819.9	5	644.0	731.2	9	715.4	775.1
<u>Quarters</u>									
First	120	391.8	397.4	120	376.2	368.4	240	384.0	383.7
Second	47	537.4	524.1	68	490.8	477.3	115	509.9	501.1
Third	24	642.2	650.9	15	582.9	586.1	39	619.4	618.6
Fourth	10	769.2	777.6	11	669.8	694.9	21	717.1	736.0
Third and Fourth	80	684.8	714.2	64	633.5	640.5	144	662.0	677.3

(All weights calculated to the second and thrown to the first decimal.)

for cerebrum weight for both sexes when taken by quarters is decidedly better than that for either males or females.

CEREBELLUM

Figure 3 shows the observed means and the calculated trends of cerebellum weight in males, females and both sexes combined. While the observed values depart somewhat from the calculated ones, there is little evidence of any consistent trend in the difference except that the computed values in the last two months seem somewhat high. The fit of the expression for cerebellum weight for both sexes is slightly better by most of the tests employed than are the fits for either male or female cerebellum weight.

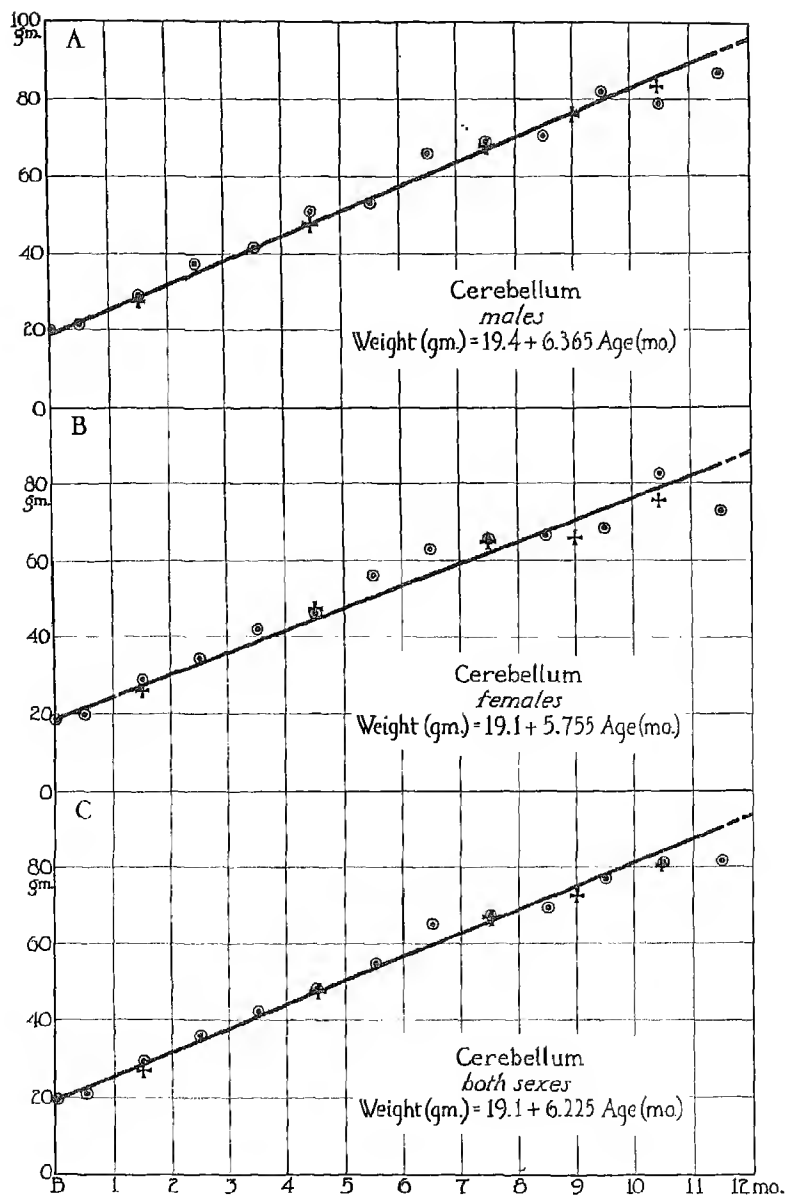


Figure 3. Graphs showing the monthly and quarterly averages of weight of the cerebellum in the first year of postnatal life. A, males; B, females; C, both sexes. Symbols as in Figure 1.

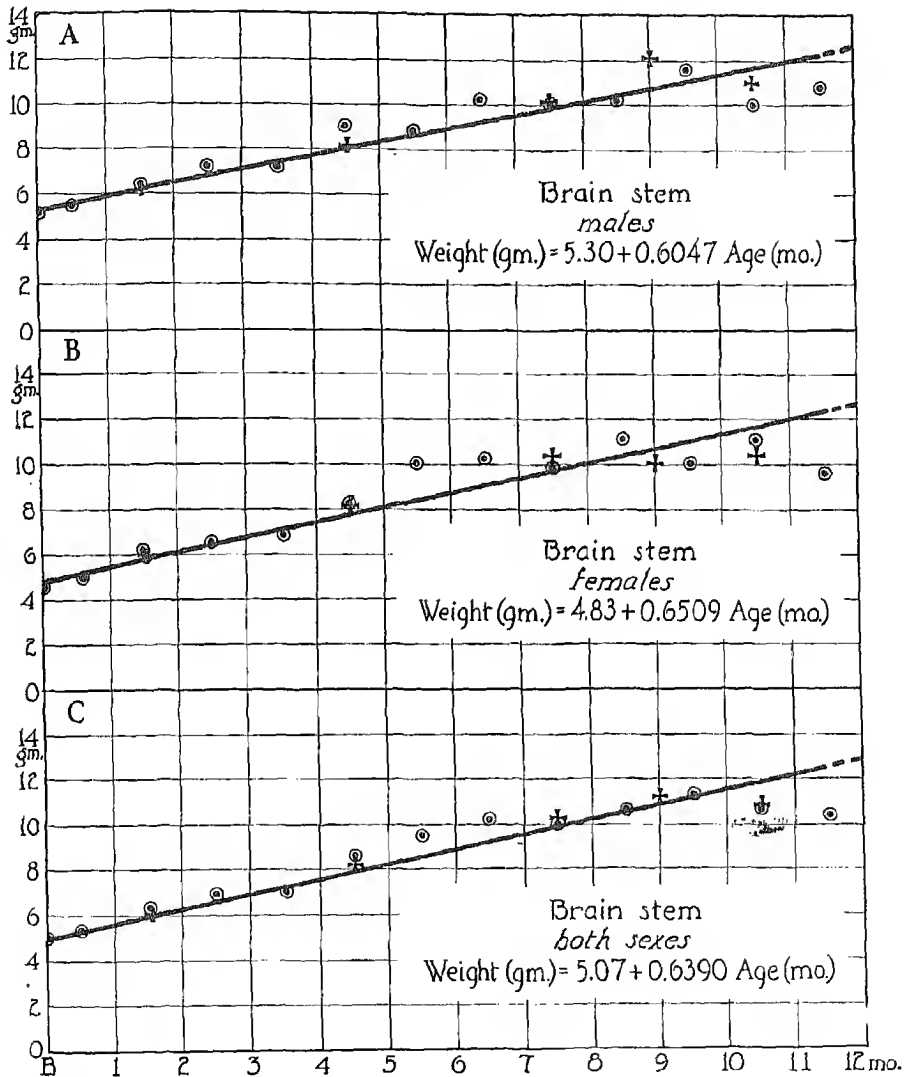


Figure 4. Graphs showing the monthly and quarterly averages of weight of the brain stem (pons, medulla and midbrain) in the first year of postnatal life. A, males; B, females; C, both sexes. Symbols as in Figure 1.

TABLE 3

OBSERVED AND CALCULATED WEIGHT OF THE CEREBELLUM
IN THE FIRST YEAR OF POSTNATAL LIFE

Age Range	Males			Females			Both Sexes		
	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)
Birth	58	20.2	19.4	41	19.4	19.1	99	19.8	19.1
<u>Months</u>									
First	45	21.4	22.6	43	20.0	22.0	88	20.7	22.2
Second	25	29.2	29.0	26	29.3	27.7	51	29.3	28.4
Third	25	37.5	35.3	24	34.5	33.5	49	36.0	34.7
Fourth	11	41.7	41.7	16	42.4	39.2	27	42.1	40.9
Fifth	8	51.1	48.0	12	46.7	45.0	20	48.5	47.1
Sixth	8	53.9	54.4	10	56.3	50.8	18	55.2	53.3
Seventh	8	66.2	60.8	5	63.4	56.5	13	65.2	59.6
Eighth	6	69.0	67.1	5	65.8	62.3	11	67.5	65.8
Ninth	6	71.0	73.5	3	67.0	68.0	9	69.7	72.0
Tenth	4	82.2	79.9	1	59.0	73.8	5	77.6	78.2
Eleventh	2	79.0	86.2	3	83.3	79.5	5	81.6	84.5
Twelfth	4	87.2	92.6	2	73.5	85.3	6	82.7	90.7
<u>Quarters</u>									
First	110	28.1	29.0	111	26.2	27.7	221	27.1	28.4
Second	41	48.3	48.0	59	47.6	45.0	100	47.9	47.1
Third	20	68.5	67.1	13	65.2	62.3	33	67.2	65.8
Fourth	10	83.6	86.2	6	76.0	79.5	16	80.8	84.5
Third and Fourth	76	76.0	76.7	57	66.7	70.9	133	72.7	75.1

(All weights calculated to the second and thrown to the first decimal.)

BRAIN STEM (PONS, MEDULLA AND MIDBRAIN)

As might be expected, there is slightly more error in the fits of the expression for this part of the brain than for the others. The methods of delimiting the boundaries of the brain stem are less accurate and differ more between observers. But in addition to this experimental error, there also seems to be some change in trend with a tendency for the observed weights in the later months to increase less rapidly than the calculated values. This is seen both in Figure 4 and in Table 4. As a whole the correlation between observed and calculated values is better for the brain stem weight for both sexes and for males than for females.

TABLE 4

OBSERVED AND CALCULATED WEIGHT OF THE BRAIN STEM
IN THE FIRST YEAR OF POSTNATAL LIFE

Age Range	Males			Females			Both Sexes		
	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)	N	Observed Weight (gm.)	Calculated Weight (gm.)
Birth	58	5.2	5.3	41	4.5	4.8	99	4.9	5.1
<u>Months</u>									
First	45	5.5	5.6	43	5.1	5.2	88	5.3	5.4
Second	25	6.4	6.2	26	6.2	5.8	51	6.3	6.0
Third	25	7.2	6.8	24	6.6	6.5	49	6.9	6.7
Fourth	11	7.2	7.4	16	6.8	7.1	27	7.0	7.3
Fifth	8	9.0	8.0	12	8.2	7.8	20	8.6	8.0
Sixth	8	8.8	8.6	10	10.0	8.4	18	9.5	8.6
Seventh	8	10.2	9.2	5	10.2	9.1	13	10.2	9.2
Eighth	6	10.1	9.8	5	9.9	9.7	11	10.0	9.9
Ninth	6	10.2	10.4	4	11.1	10.4	10	10.6	10.5
Tenth	4	11.6	11.0	1	10.0	11.0	5	11.3	11.1
Eleventh	2	10.0	11.7	3	11.1	11.7	5	10.7	11.8
Twelfth	4	10.8	12.3	2	9.6	12.3	6	10.4	12.4
<u>Quarters</u>									
First	110	6.3	6.2	111	6.0	5.8	221	6.1	6.0
Second	41	8.2	8.0	59	8.2	7.8	100	8.2	8.0
Third	20	10.2	9.8	14	10.4	9.7	34	10.3	9.9
Fourth	10	11.0	11.7	6	10.4	11.7	16	10.8	11.8
Third and Fourth	76	12.1	10.7	60	10.1	10.7	136	11.2	10.8

(All weights calculated to the second and thrown to the first decimal.)

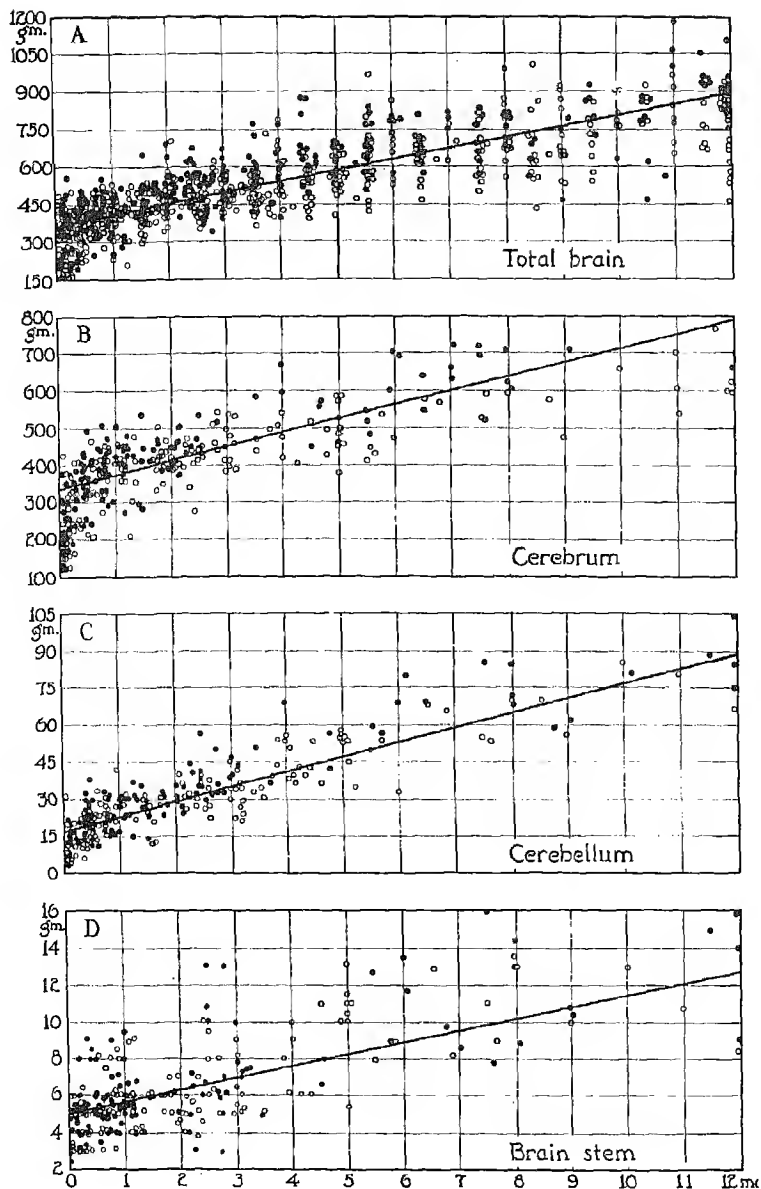


Figure 5. Field graphs showing the distribution of individual records of weights of the total brain (encephalon), cerebrum (cerebral hemispheres and thalamencephalon), cerebellum, and brain stem (pons, medulla and midbrain) in the first year of postnatal life. Males, solid dots; females, open circles. The solid lines drawn through the panel represent the empirical formulae for the weight in both sexes given in Figures 1, 2, 3 and 4.

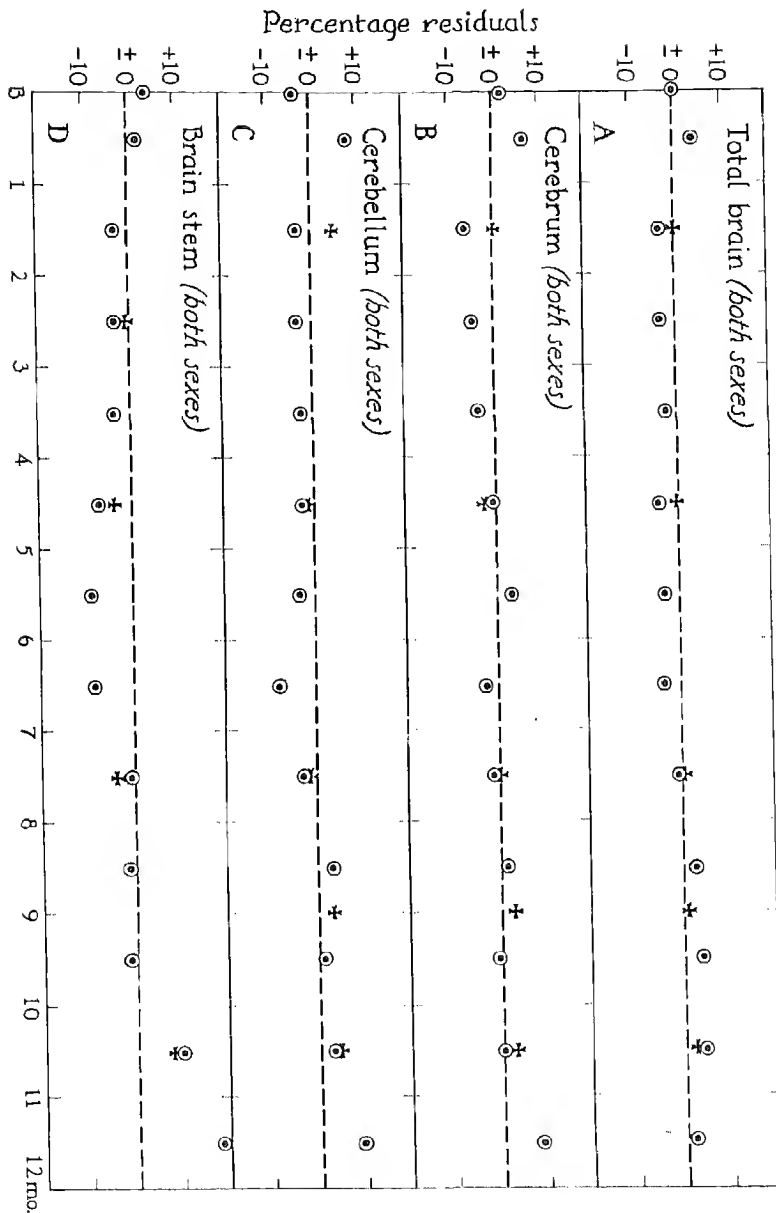


Figure 6. Graphs showing the distribution of relative residuals of calculated from observed values for the total brain and its several parts in the first year of postnatal life. Circled dots, natal and monthly values; crosses, quarterly values.

TABLE 5

TESTS OF GOODNESS OF FIT OF RECTILINEAR FORMULAE FOR THE GROWTH OF THE BRAIN
AND ITS SEVERAL PARTS IN THE FIRST YEAR OF POSTNATAL LIFE

	Residuals of Calculated from Observed Monthly Means					Residuals of Calculated from Observed Quarterly Means				
	N	Mean Absolute (gm.)		Mean Relative (per cent)		N	Mean Absolute (gm.)		Mean Relative (per cent)	
		Wt'd by N	Unwt'd by N	Wt'd by N	Unwt'd by N		Wt'd by N	Unwt'd by N	Wt'd by N	Unwt'd by N
<u>Total Brain</u>										
Males	637	17.0	26.5	3.2	4.0	732	12.9	14.1	2.2	2.4
Females	582	12.3	16.2	2.5	2.7	676	3.6	3.8	0.6	0.7
Both Sexes	1281	13.3	18.5	2.6	3.0	1493	5.5	6.3	0.9	1.0
<u>Cerebrum</u>										
Males	235	13.0	12.6	3.2	2.5	310	12.5	12.9	2.2	2.3
Females	217	21.0	20.4	5.4	4.2	297	9.8	10.5	2.4	2.6
Both Sexes	452	15.3	15.6	3.8	3.1	607	6.0	6.9	1.1	1.3
<u>Cerebellum</u>										
Males	210	1.5	2.5	4.1	4.3	285	0.7	0.7	2.4	2.1
Females	191	2.1	4.4	5.9	8.0	268	2.1	2.2	5.2	4.8
Both Sexes	401	1.5	2.3	4.4	4.2	553	1.4	1.3	3.7	3.4
<u>Brain Stem</u>										
Males	210	0.3	0.6	3.6	5.9	285	0.5	0.4	4.3	4.2
Females	192	0.4	0.7	5.4	8.2	271	0.3	0.4	4.9	5.4
Both Sexes	402	0.3	0.6	4.1	6.0	556	0.2	0.2	2.5	2.8

(All values calculated to the second and thrown to the first decimal.)

Two additional figures may aid in the exposition of this material. Figure 5 shows the distribution of individual observations. The males are indicated by solid and the females by open dots. The line of central tendency in each case represents the calculated expression for the weight in question in both sexes. Figure 6 is a relative residual graph showing the deviations of calculated from observed values (in per cent of the latter) for the total brain and its several parts. In each instance the observed value is considered as zero and the deviations of the computed values from this base are shown by appropriate symbols in their relative position on the vertical scale.

USE OF THE BIOGRAPHICAL METHOD IN THE STUDY
OF MOTOR COORDINATION

E. B. HURLOCK AND G. McHUGH¹

In the early biographical studies of babies, reports are given of the age at which certain motor abilities, such as sitting, standing, etc., occurred in the individual babies studied. The recent experimental studies of motor development, carried out on large groups of babies as contrasted with single cases used for the biographical studies, have shown slightly different average ages for the appearance of different forms of motor coordination. It therefore seemed to the writers that it would be interesting to compare the two types of studies to see how they agree to differ.

From the many biographical studies, only that material was used which gave the date or approximate time of complete development of a specific motor ability. Four types of comparison were made: 1) comparison of average ages for certain aspects of motor development in babies studied biographically with feeble-minded children; 2) comparison with gifted or exceptional children; 3) comparison with group averages; and 4) comparison with baby test norms.

The different forms of motor activity selected for detailed study were as follows: (a) purposeful reaching and grasping; (b) use of thumb in opposition to fingers; (c) sitting alone; (d) crawling and creeping; (e) standing without support; and (f) walking.

In Table 1 is given a summary of ages at which the six forms of motor activity listed above appeared, as reported by fourteen of the well-known baby biographers:

1. Comparison of Biographical Studies with Studies of Feeble-Minded Children.

A comparison was made of the biographical material with Mead's (19) study of feeble-minded children, so far as age of first walking is concerned. Mead used two groups of children as subjects for his study; the first, the "normal" group, consisted of 25 boys and 25 girls; the second, the "feeble-minded" group, consisted of 144 "schoolable" defectives from the Indiana School for Feeble-Minded Youth, of which 84 were boys and 60 girls.

The ages of walking for his two groups of subjects, as well as the data obtained from the biographical studies reporting the age of first walking are summarized in Table 2.

From Table 2 it may be seen that Mead reports that the median age for normal boys to begin to walk is 13.87 months; for normal girls, 13.21 months; and for both sexes combined, 13.54 months. This is contrasted with a median age of 22.2 months for feeble-minded boys, 20.76 months for feeble-minded girls and 21.6

¹ From Columbia University. The study was suggested, planned and prepared for publication by the senior writer. The junior writer carried out the research work and prepared the tables of figures.

Table 1

Material from Fourteen Baby Biographers Showing the Ages in Months at which Certain Motor Reactions Appear.						
Biographer	Purpose- ful Reaching and Grasping	Thumb Opposi- tion to Fingers	Sitting Alone	Crawling Creeping	Standing without Support	Walking Alone
Shinn		2.25	4.75	8.50	9.00	12.00
Fenton	5.50	3.00	4.25	7.75		12.00
Moore	3.75	3.00		11.00		14.00
Dearborn	4.00	2.50	6.00	12.50	14.00	15.50
Hall	4.50		4.75	13.50	12.13	14.20
Major	4.25	4.25		11.50	12.80	14.50
Preyer	4.75	3.00	9.75	12.25	11.00	15.20
Whipple				7.50	11.00	13.50
Sully	4.75					
Perez					9.00	
Hazzard	4.00	3.30	4.50			
McLeish	4.00	1.15	5.00	13.00		14.00
Myers	3.30					
Warden				10.50		13.00
TOTALS	42.80	23.05	39.00	108.00	78.93	137.90
N	10	8	7	10	7	10
Median	4.125	3	4.75	11.25	11	14
Arith. Average	4.28	2.88	5.57	10.80	11.28	13.79
		4.25	4.25-	7.5-		12-
Range	3.3-5.5	1.75-	9.75	13.5	9.-14	15.5
A.D. (Average)	.54	.59	1.31	1.79	1.46	.95
S.D. (Average)	.223	.72	1.78	2.08	1.73	1.14

Table 2

Average Walking Ages in Months for Normal and Feeble Minded Groups.						
N	Condition	Sex	Authority	Median	Average	Range
50	Normal	Both	Mead	13.54	13.88	11-30
25	Normal	Boys	Mead	13.87	14.28	11-30
25	Normal	Girls	Mead	13.21	13.48	11-18
10	Normal	Both	Biograph- ies	14.00	13.79	12-15.5
7	Normal	Boys	Biograph- ies	13.50	13.77	12-15.2
144	Feeble- minded	Both	Mead	21.60	25.80	12-36
84	Feeble- minded	Boys	Mead	22.20	25.80	12-36
60	Feeble- minded	Girls	Mead	20.76	24.24	12-36

months for both sexes. According to data from 10 biographical studies, the median walking age for 7 normal boys and 3 girls was 14 months which is almost identical with the age reported by Mead for normal children of both sexes.

Wallin (24) in 1927 compiled some statistics relating to certain aspects of motor development in normal and feeble-minded children. His data are presented in Table 3, together with data from biographical studies.

Table 3

Wallin's Data Contrasted with Baby Biographies.				
Description of Stages	N	Types and Source	Age	
			Years	Months
A.				
Sitting unsupported	262	Normal (Wallin)	.58	6.96
Sitting unsupported	139	Feeble-Minded (Wallin)	.97	11.64
Sitting unsupported	7	Normal (Biographies)	.46	5.57
B.				
Standing unsupported	291	Normal (Wallin)	1.01	12.12
Standing unsupported	170	Feeble-Minded (Wallin)	1.68	20.16
Standing unsupported	7	Normal (Biographies)	.94	11.28
C.				
First steps unsupported	258	Normal (Wallin)	1.12	13.44
First walked	343	Normal (Wallin)	1.23	14.76
First steps	148	Feeble-Minded (Wallin)	1.89	22.68
First walked	188	Feeble-Minded (Wallin)	2.08	24.96
Walking	10	Normal (Biographies)	1.14	13.79

Once again, the data relating to the normal baby are very similar to the baby biographies as is shown in the large groups studied by Wallin. There is, however, a marked difference in ages of motor control in normal as contrasted with feeble-minded children, as was reported in Mead's (19) study.

2. Comparison of Biographical Studies with Terman's Study of Gifted Children.

In his investigation of the development of gifted children, Terman (36) recorded the ages of sitting and walking alone as reported to him from physicians' records compiled from testimony given by mothers. This material, together with data from biographical studies for the purpose of comparison of the two, is presented in Table 4.

An inspection of this table will show that the data from biographies coincide fairly closely with Terman's data. A comparison of the median ages for sitting alone shows that the children in the biographical studies were .26 months ahead of the boys and .24 months ahead of the girls of Terman's study. On the other hand,

Table 4

Terman's Data on the Average Month at which Exceptionally Bright Boys and Girls Sit Alone and Walk Alone.								
Groups	N.	Sitting Alone			N.	Walking Alone		
		Average	Median	S.D.		Average	Median	S.D.
Boys (Terman)	220	5.96	5.83	1.46	300	13.10	12.87	2.63
Girls "	196	5.88	5.81	1.70	264	12.87	12.72	2.46
Boys and Girls (Biographies)	4 & 3	4.75	5.57	1.78	7 & 3	14.00	13.79	1.14

the median age for walking alone was .92 months later for the biographical group than for Terman's boys and 1.07 months later than Terman's girls.

3. Comparison of Biographical Studies with Group Averages.

Shirley (30, 31), in a study of the development of mental and motor processes over a two-year period, reports data for 25 babies presented in Table 5.

Table 5

Shirley's Data on the Median Ages for Certain Forms of Motor Development							
Description of Stage	N	Source	Medians Age in		Weeks		Weeks Range
			Weeks	Months	Q 1	Q 3	
Grasp lying posture	23	Shirley	15	3.75	13	17	
Retain lying posture	23	Shirley	18	4.50	15	18	
Grasp and retain sitting posture	23	Shirley	18	4.50	15	19	
Reach for dangling object	22	Shirley	19	4.75	16.5	21	
Grasp dangling object	22	Shirley	21	5.25	19	22.5	
Purposeful reaching and grasping	10	Biographies	17	4.25			13.2-22
Thumb opposition	23	Shirley	18	4.50	15	21	
Thumb in opposition to fingers	8	Biographies	12	3.00			7 - 17
Sit alone momentarily	22	Shirley	25	6.25	20.5	26	
Sit alone one minute	20	Shirley	31	7.75	27	34	
Sitting alone	7	Biographies	19	4.75			17 - 39
Creep	22	Shirley	44.5	11.12	41	45	
Crawling and creeping	10	Biographies	45	11.25			30 - 52
Standing alone	21	Shirley	62	14.50	56	66	
Standing without support	7	Biographies	44	11.00			36 - 56
Walking alone	21	Shirley	64	15	59	67	
Walking	10	Biographies	56	14			36 - 62

A critical analysis of this table will show not only some striking differences between the median ages of the biographical groups and the groups studied by Shirley, but it will also show the differences in the two types of study. For example, Shirley studied all the intermediate stages leading up to the ability to grasp while the biographers have referred only to the ability as being present with no thorough description of the degree of the ability. For that reason, it is difficult to make a comparison of the two types of study. Whether the earlier appearance of different forms of motor ability in the case of the babies of the biographical studies was due to selection of subjects or to lack of exactness in the reports is difficult to determine. With the exception of creeping, the biographers report an earlier development of each motor activity than did Shirley.

Jones (14), in her study of "The Development of Early Behavior Patterns in Young Children" made systematic observations of such activities as smiling, eye coordination, head support, thumb opposition, reaching, sitting, etc., together with the ages at which the activities appeared in a group of babies. In Table 6 are given the ages at which these activities appeared, together with ages for similar activities as reported by baby biographers.

Table 6

Jones' Data on the Ages at which 50 Per Cent of her Groups of Children Reached the Stages of Thumb Opposition, Reaching and Sitting.				
Stage	N	Average	50 Percentile	Source
Thumb opposed	512		4.93 months	Jones
Thumb opposed	8	2.88 months		Biographies
Reaching	486		5.06 months	Jones
Reaching	10	4.28 months		Biographies
Sitting	292		7.23 months	Jones
Sitting	7	5.57 months		Biographies

A comparison of Jones' results with the biographical records shows that the baby biographers tend to place the ages for the appearance of thumb opposition, reaching and sitting earlier than the norms given in Jones' study. In the case of thumb opposition and sitting, the difference is pronounced.

4. Comparison with Baby Test Norms.

Since the appearance of Kuhlmann's (15) Revision of the Binet-Simon Test in 1922, there have been a number of "baby tests" and "norms" of development. While all of these do not agree completely about the age at which the average baby should be able to carry out a specific activity, nevertheless, the agreement is pronounced enough to justify a comparison of these tests with the ages at which baby biographers reported the appearance of similar activities. This comparison is given in Table 7.

As may be seen from this table, the average ages reported by biographers for the appearance of different activities are earlier than the ages given as standards for baby tests. This difference may, to a certain extent, be due to the difference in standards used by the two groups. For example, in "sitting alone", the

Table 7

Age Chart for Comparison of Baby Tests and Biographical Averages.				
Description of stage	Biog. Av. Months	No. Biog. Reporting	Test Norms Months	Names of Tests
Purposeful reaching and grasping	4.28	10		
Reaching for seen objects			6.	Kuhlman
Reaching and manipu- lation			6.	Gesell
Reaches for cube			4.5	Bayley
Picks up 2 cubes			5.2	Bayley
Reaches persistently			6.	Bayley
Unilateral reaching			6.4	Bayley
Thumb opposition to fingers	2.88	8		
Thumb opposition in grasping			6.	Kuhlman
Opposes thumb			9.	Gesell
Beginning thumb oppo- sition			4.1	Bayley
Partial thumb oppo- sition			5.1	Bayley
Simultaneous flexion and thumb opposition			5.7	Bayley
Complete thumb opposition			7.6	Bayley
Sitting alone	5.57	7		
Sitting unsupported			12.	Kuhlman
Sits momentarily with- out support			8.	Gesell
Sits alone			9.	Gesell
Standing without sup- port	11.28	7		
Standing unsupported			12.	Kuhlman
Stands supporting self			12.	Cunningham
Stands alone			15.	Gesell
Walking	13.79	10		
To Walk without help			18	Cunningham
Walks alone			15	Gesell

baby biographers are not specific regarding how long the baby sits alone at one time while in the different baby tests, specific instructions are given about how long the baby must sit to pass the test. This discrepancy may be responsible for the differences found in connection with the other activities reported.

SUMMARY AND CONCLUSION

A survey of this study brings out the following points:

1. Child biographies do not lend themselves to combination to present a general picture of babyhood because, 1) no two observers record the same thing, 2) most records are anecdotal, 3) differences in situations developed, 4) differences in method employed appear, 5) and differences in criteria for traits as recorded by different biographers occur.

2. From studies of Mead (19), and Wallin (24), there is a definite linking of the development of motor coordination with intelligence.

3. The average child of whom biographical studies have been made is slightly more advanced in the stages of motor coordination selected than normal groups studied by Mead (19), or Wallin (24).

4. The feeble-minded child is definitely retarded in the development of motor coordination.

5. The average child of whom biographical studies have been made compares favorably with the exceptionally bright child, as studied by Terman (36), in the development of motor coordination.

6. The thoroughness in interpretation of stages of motor coordination in group studies makes clear the difficulty of comparing the biographical averages with group averages.

7. There are clear cut advances in objective tests of intelligence for the pre-school ages based on the development of motor coordination.

REFERENCES

- (1) Bayley, Nancy: The California first year mental scale. University of California, Syllabus Series 1933, No. 243, 1-24.
- (2) Chamberlain, A. F. and S. C.: Studies of a child, *Ped. Sem.*, 1904, 9, 264.
- (3) Chrisman, Oscar: One year with a little girl. *Educ. Rev.*, 1895, 9, 52-71.
- (4) Cunningham, Bess V.: Motor development of infants and young children. *Educ. Psychol.*, 1927, 18, 450-464.
- (5) Darwin, Charles: A biographical sketch of an infant. *Mind*, July 1927, 2, 285-294.
- (6) Dearborn, G. V. N.: Moto-sensory development. Baltimore, Warwick and York, 1910, pp. 1-213.
- (7) Fenton, J. C.: A practical psychology of babyhood. Boston and New York, Houghton Mifflin, pp. 1-347.
- (8) Gesell, Arnold: Infancy and human growth. New York, MacMillan, 1928, pp. 1-135.
- (9) Gesell, Arnold: The mental growth of the pre-school child. New York, MacMillan, 1925, pp. 1-88.
- (10) Goodenough, Florence L.: A new approach to the measurement of the intelligence of young children. *Ped. Sem. and J. Genet. Psychol.*, 1926, 33, 185.
- (11) Hall, W. S.: First five hundred days of a child's life. *Child Study Monthly*, 1896-1897, 2, 394-405; 586-608.
- (12) Hazzard, F. W.: Development of an infant in grasping, reaching, and body movements. *Child Development*, 1931, 2, 158-160.
- (13) Johnson, Ruford J.: Child psychology. Charles C. Thomas, 1932, pp. 7-146.
- (14) Jones, Mary C.: The development of early behavior patterns in young children. *Ped. Sem. and J. Genet. Psychol.*, 1926, 33, 537-585.
- (15) Kuhlman, F.: A handbook of mental tests. Baltimore, Warwick and York, 1922, pp. 1-150.
- (16) Linfert, Harriet E., and Hierholzer, Helen M.: Mental development of infants; Studies in psychology and psychiatry, June, 1928, 1, No. 4, 1-27.
- (17) Major, D. R.: First steps in mental growth. New York, MacMillan, 1906, pp. 14-360.
- (18) McLeish, Mrs. A.: Observations on the development of a child during the first year. *Trans. Illinois Society Child Study*, 1898, 3, 109-124.

- (19) Mead, C. D.: Age of walking and talking in relation to general intelligence. Reprinted from *Psychology Survey*, December 1913, 20, 460-484.
- (20) Moore, K. C.: Mental development of a child. *Psychol. Monog.*, New York, MacMillan, 1896, 1, 13-44.
- (21) Murphy, Gardner: Historical introduction to modern psychology. London, Harcourt Brace, 1932, pp. 279-288.
- (22) Myers, G. C.: Grasping, reaching and handling. *Am. J. Psychol.*, 1915, 26, 525-539.
- (23) Perez, Bernard: The first three years of childhood. New York, E. L. Kellogg Company, pp. 24-294.
- (24) Pintner, Rudolph: The feeble minded child. *Murchison's Handbook of Child Psychology*, 1933. 2nd Rev. Ed., pp. 802-841.
- (25) Pratt, Karl C.: The behavior of the new born infant. Ohio State University Press, 1930, pp. 1-212.
- (26) Pratt, Karl C.: The neonate. *Murchison's Handbook of Child Psychology*, 1933, 2nd Rev. Ed., pp. 163-206.
- (27) Preyer, T. W.: Senses and the will. New York, D. Appleton, 1888, pp. 187-346.
- (28) Sherman, M. and Irene C.: The process of human behavior. W. Norton Company, 1929, pp. 91-113.
- (29) Shinn, Millicent: Biography of a baby. Cambridge, Mass. Houghton Mifflin, 1900, pp. 1-247.
- (30) Shirley, Mary M.: Locomotor and visual-manual functions in the first two years. *Murchison's Handbook of Child Psychology*, 1933, 2nd Rev. Ed., pp. 236-270.
- (31) Shirley, Mary M.: The first two years. Univ. Minnesota Press, 1931, 1 and 2, 1-181; 3-34.
- (32) Simpson, W. G.: A chronicle of infant behavior. *J. Mental Sci.*, 39, 378-389; 498-505.
- (33) Stern, William: Psychology of early childhood. Translated by A. Barwell, New York, Henry Holt, pp. 32-43.
- (34) Stutsman, R.: Performance tests for children of pre-school age. *Genetic Psychol. Monog.*, 1926, 1, 1-68.
- (35) Sully, James: Studies of childhood. New York, Longman Green, 1895, 399-480.
- (36) Terman, Lewis M.: Genetic studies of genius. Stanford Univ. Press, 1925, 1, 173-214.
- (37) Warden, C. J.: Notes of a male infant. *Fed. Sem. and J. Genet. Psychol.*, 1928, 35, 328-330.

A CONTINUOUS RECORDER FOR OBTAINING SYNCHRONOUS CURVES OF
PHYSIOLOGICAL RESPONSES TO STIMULI IN HUMAN SUBJECTS¹

N. W. SHOCK²

The following apparatus has been designed and built for the purpose of obtaining simultaneous records of as wide a range of physiological reactions as possible. Changes in pulse rate, relative limb volume, respiratory rate and amplitude, apparent electrical resistance of the skin at two different parts of the body, muscular tension, and gross body movement are recorded photographically by this technique. The essential parts of the apparatus are:

- (1) The photo-recorder or camera
- (2) The recording unit
- (3) The electrical units

Photo-recorder

Figure 1 shows the general arrangement of the apparatus. The photo-recorder (1) and recording unit (2) are shown on the left, while the two Wheatstone bridges for the electrode systems are shown on the right (3, 4). These latter will be more fully described in the section on Electrical Units.

The photo-recorder shown in detail in Figure 2 consists essentially of a synchronous motor geared to draw 5-inch wide bromide paper (Eastman FMC #1, normal, on No. 1 Core) past a 1/16 inch aperture at a speed of eight inches per minute. The motor used has a 500:1 gear reduction attached directly to the 1800 RPM motor² (1). The paper supply (in 100 foot rolls) is placed on the upper spindle (2) from which it passes over the rubber covered roller (3) past the aperture (4) through the driving rollers (5) and to the rewind roll (6). Accessory gears are provided so that intermediate paper speeds of 2, 3, and 6 inches per minute may be used if desired. The pointer (5, Fig. 1) revolves when paper is being run through the camera. The opening of the aperture is regulated by a lever (6, Fig. 1). In order to provide a horizontal grid on the record for ease in reading, the aperture is covered by a sheet of celluloid on which vertical lines have been ruled at 1/8 inch intervals. This gives continuous horizontal white lines. The dial (7, Fig. 1) on the record when developed indicates the amount of paper remaining in the camera unexposed, and is operated by the cam (8, Fig. 2). The driving gears are on the outside of the camera box (8, Fig. 1).

Recording Unit

A. General Outline

The separate units are assembled into a large heavy wood box (Figures 3 and 4)

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¹ Acknowledgment for many details in design and construction is due to Mr. F. M. Henry.

² Synchronous Motor, Type NSY-12 R. May be obtained from the Bodine Electric Company, Chicago, Illinois.

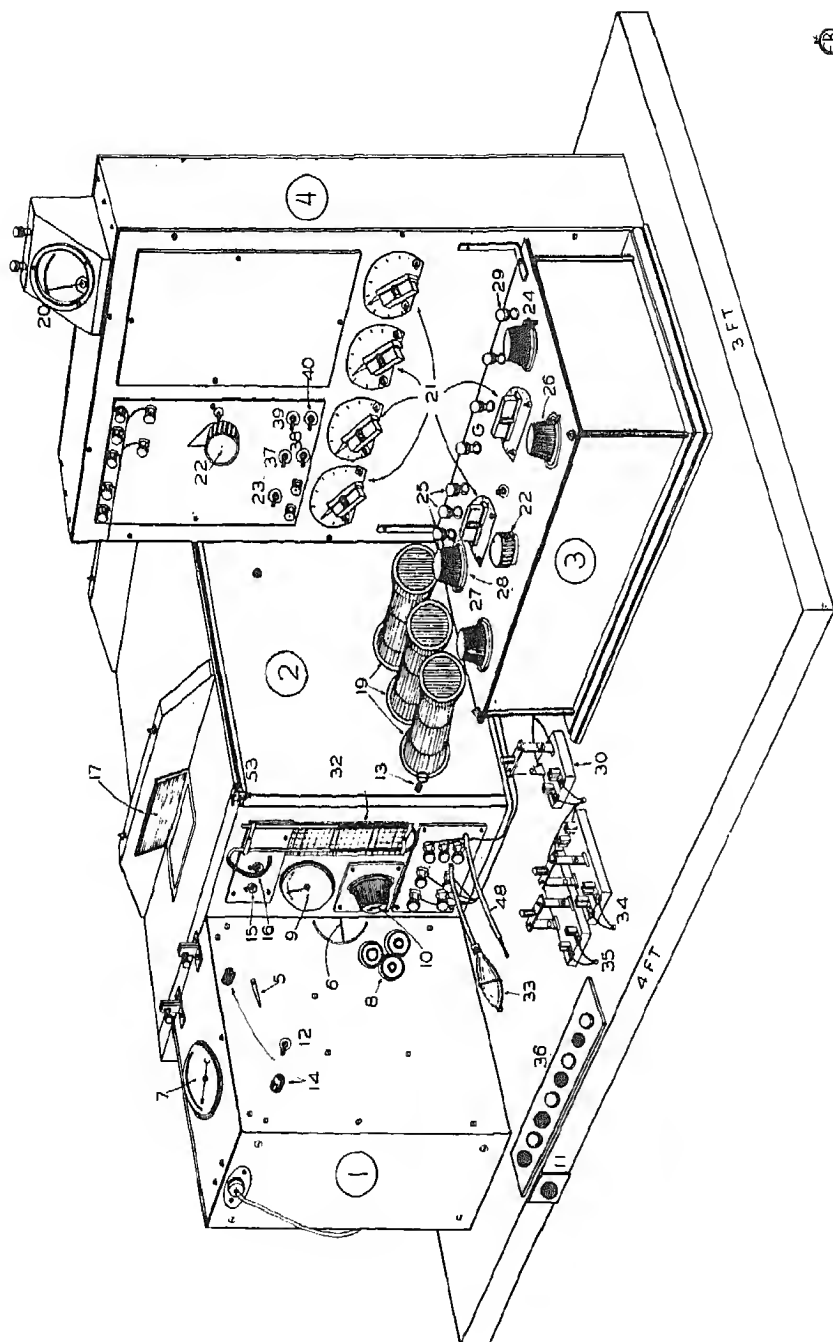


Figure 1

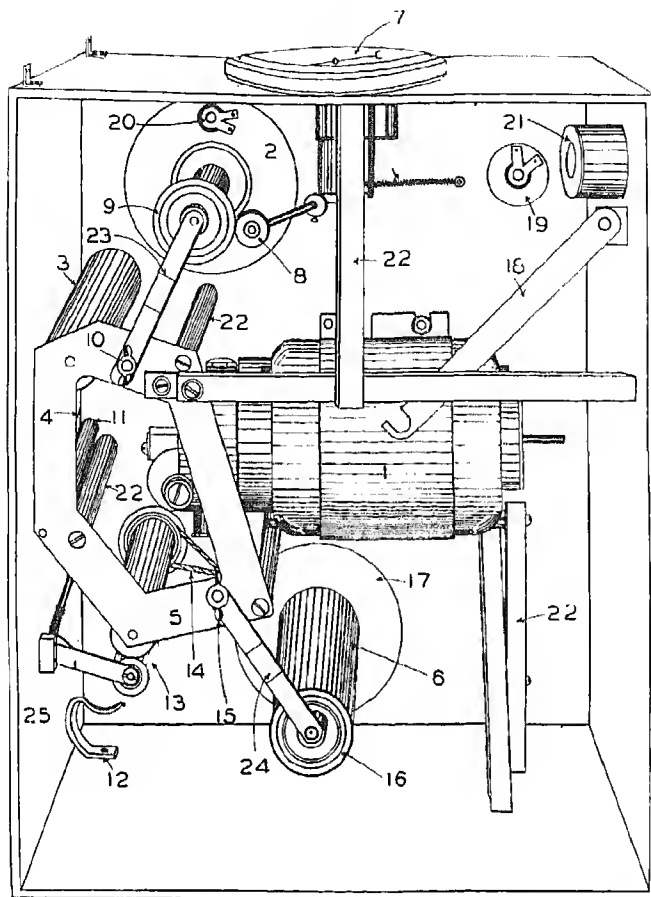


Figure 2

to give stability to the electrical and optical systems involved. Since shadows from pointers and moving light points are both used in this recorder, a light source of relatively low intensity and of parallel beams is needed to provide the grey background on the record. For this purpose a two candle power automobile light is used (1) (see left side of Figs. 3 and 4). The light is placed at the focal point of a 9-inch plano-convex lens (diameter 5 inches, focal length 9 inches) (2). The upper and lower half of this lens were ground off in order to leave the space uninterrupted for the light paths of the galvanometer and blood pressure recording systems which will be described later. Since differences in the sensitivity of the bromide paper occur, a rheostat (3) (see right side of Fig. 3) and voltmeter were placed in circuit with this light so that its intensity could be varied at will or reliably controlled. (These attachments, numbered 9 and 10, also appear in Fig. 1). A telechron motor of one revolution per second (4, Figs. 3 and 4) with vane attached (5, Fig. 4) interrupts the light source at one-second intervals, producing the vertical time lines on the record.

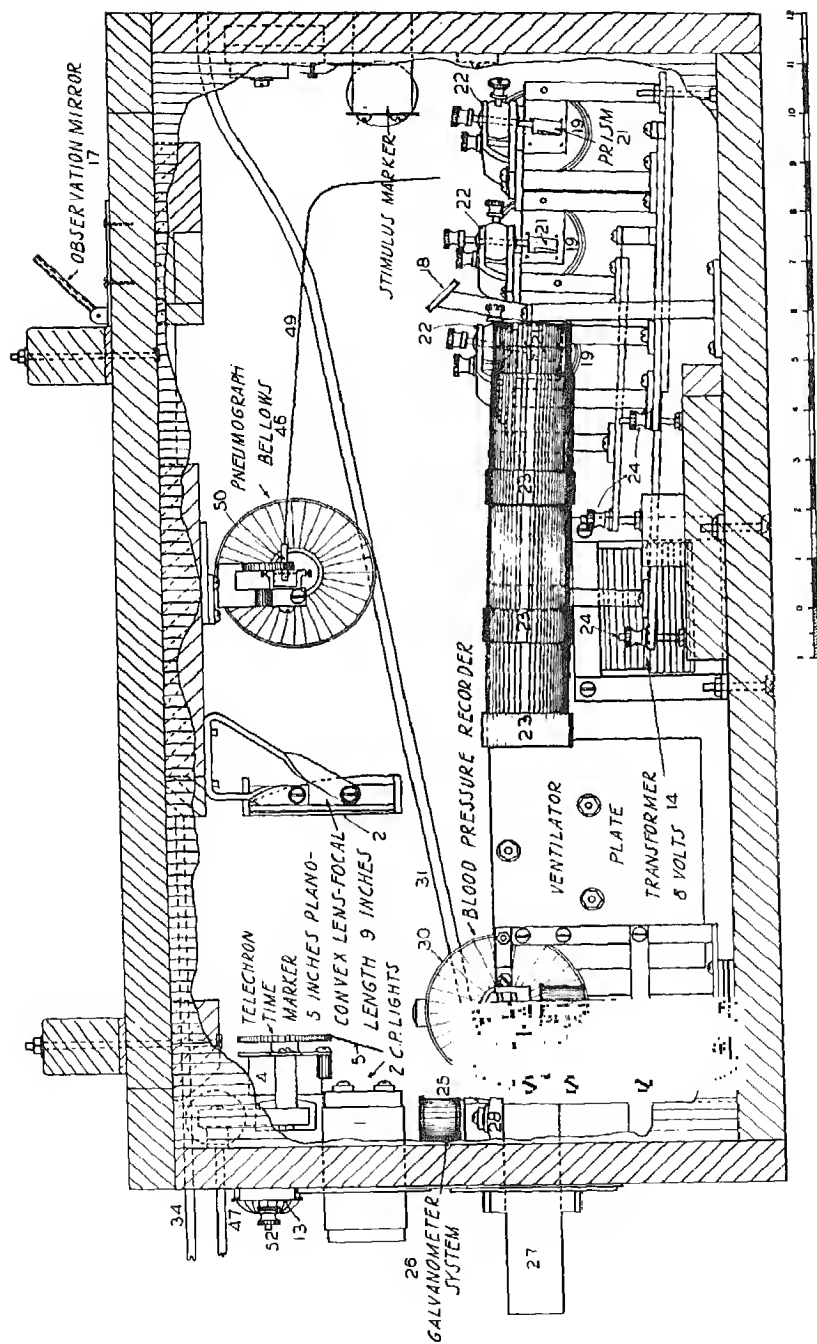


Figure 4

Two signal markers are provided. The first (stimulus marker I) (6, upper right, Fig. 3) consists of a two candle power lamp mounted in a telescope (7) attached to the front of the recorder box which throws a beam of light on the edge of the photographic paper by reflection at 90° from a mirror (8) whenever the electrical circuit is closed through an appropriate external switch (11, Fig. 1). The second marker (stimulus marker II, shadow) (9) consists of a small lever (10) which is normally held above the background light falling on the camera slit by a spring (11), but which is drawn down to intercept the beam of light, producing a white mark on the edge of the record, whenever the ring (12) is pulled. This is ordinarily used to mark changes in base of the galvanometer recording systems.

From the 110 volt, alternating circuit plug (13) at the back of the recorder box (left side, Figs. 3, 4) leads are connected to the telechron time marker (4) and to an 8 volt transformer (14, upper center, Fig. 3) which provides the necessary current source for the galvanometer lamps (19, upper right, Fig. 3), stimulus marker I (6), background light (1), and also to small two candle power cowl lamps (14) on the front of the recorder box which make it possible to see the blood pressure manometer (32) and voltmeter (9, Fig. 1) when the instrument is used in semi-darkness. Switches to control the various light circuits are also mounted on the front panel (15, 16, Fig. 1).

Mirrors (17, 18) are set at the appropriate angle so that the operator, who sits at the camera end of the recorder, may see the image of the camera slit and check the position of the shadows and light points of the instruments.

B. Galvanometer Recording Systems

In order that the deflection curves might be directly comparable, two identical galvanometer recording units were incorporated into the apparatus. Galvanometer lamps were constructed from 2-inch brass tubing, using lenses of 10-inch focal length and mounted on the side of the recorder box (19, Fig. 3). The light from the galvanometer lamp is focused on a 0.003 inch vertical slit (20) placed directly in front of a right-angle prism (21). The prism is mounted on a universal ball and socket joint (22) so that the light beam can be easily adjusted to pass through the supplementary telescope (23) which contains a lens of 10 cm. focal length. By means of the lens mounting adjustment (24) the image of the light slit (20) is focused on the camera slit by reflection from the plane mirror (25) of the galvanometer suspension. The galvanometers (26) were mounted at the rear of the recording box with the magnets projecting through the end of the box (27).

The proper angle of adjustment was obtained by a clamping device of two tapered brass bars on the magnet pole pieces (28). Intermediate leads were brought to the galvanometer binding posts (29). The galvanometers used were Leeds-Northrup No. 4799-A enclosed lamp scale instruments with a period of 3 seconds, coil resistance, 1,000 ohms, critical damping resistance of 15,000 ohms, sensitivity 0.025 microampere per mm. at 10 cm. In order to use these instruments, the concave mirror with which they are equipped must be replaced with a plane mirror of the same size.

C. Pulse Rate Recorder³

The pulse rate recording system consists essentially of a beam of light which is made to deflect across the camera slit with each heart beat by reflection from a mirror attached to a metal bellows actuated by a pneumatic system from the subject's arm or leg. Metal bellows⁴ have been found superior to tambours with rubber diaphragms since the former are permanent and need very little adjustment. The middle galvanometer lamp on the side of the recorder (19, Figures 1, 3 and 4) serves as a light source. The light beam passes through the slit (20, Fig. 3) right-angle prism (21), and supplementary lens system (23) in the same manner as the light paths for the galvanometers. However, in this instance the image of the light slit is focused on the camera aperture by reflection from a galvanometer mirror (30-A) attached to the pneumatic bellows (30). The metal bellows is connected by copper tubing (31) to the manometer (32) and release bulb (33) at the front of the recorder, and to the connection to the sphygmomanometer cuff on the subject at the rear of the recorder (34). In this way the cuff on the subject's arm or leg is inflated to a constant pressure, as shown on the manometer (32), by the pressure bulb at the front of the recorder (33, Figs. 1, 4). A detailed drawing of the mounting of the bellows is shown in Fig. 5. The metallic bellows (30) is mounted in a rigid frame (35) which is pivoted at (36). The position of the frame is adjustable by means of the knurled thumb screw (37) which limits the extension of the springs (38). By means of this adjustment the bellows may be operated to give a record at any desired internal pressure of the system as determined by the manometer (32, Figs. 1 and 3). A hexagon nut (39, Fig. 5) holds the bellows from pulling the fine connecting chain (40) out of adjustment when the pressure is released. A plane galvanometer mirror (41) is mounted on a pivoted stirrup (42) and connected by means of a light wire chain (40) to the free end of the bellows on one hand (43) and to a light spring (44) on the other. In order to damp out slight extraneous vibrations of the mirror system caused by interfering factors such as vibration of the camera motor, etc., a vane attached to the mirror and stirrup is suspended in an oil pot (45).

D. Respiration Recording System

A metal bellows, similar to that used in the pulse rate recorder, serves as the essential part in the respiration recorder. Since the necessary sensitivity of this system is considerably less than that of the pulse recording system, the bellows mounting is considerably simplified. The internal pressure used is never much below or above atmosphere so no provision for inflating and deflating is necessary. The bellows is suspended from the under-side of the cross-piece on the top of the recorder box (46, Figs. 3 and 4) and is connected by copper tubing (47) to a pneumograph attached to the subject. A connection is made to a valve at the front of the recorder (48) (Figs. 1 and 3) to provide a zero adjustment to the system after the pneumograph has been attached to the subject. A long pointer (49) which is activated by changes of pressure in the bellows through the pivoted

³ In addition to changes in pulse rate, the record obtained from this system shows changes in mean volume of the limb. The physiological significance of these changes is still under investigation.

⁴ These bellows may be obtained from the Cook Electric Company, Southport Avenue, Chicago, Illinois.

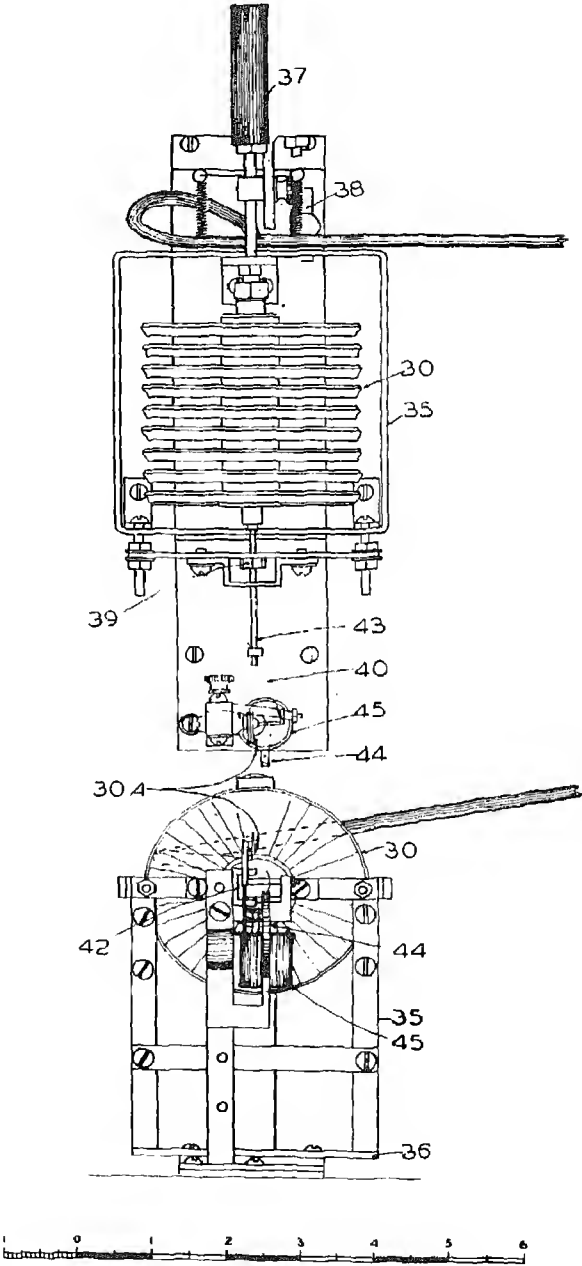


Figure 5

system, (50), casts its shadow on the photographic paper through the camera slit which provides a record of rate and amplitude of respiration.⁵

E. Bed Movement Recorder and Signal Magnets ⁶

The record of movement during the experiment is obtained from the electrical changes induced in a secondary coil attached to the bed springs of the cot on which the subject lies and recorded by a small Jewell pointer type galvanometer which casts its shadow on the camera slit. A bank of four such galvanometers has been mounted at the extreme front end of the recorder unit (51) with lengthened pointers of light aluminum wire hanging down over the camera slit. Connections to the various devices used are made through the row of binding posts at the rear of the recorder box (52, Fig. 3 and 4). These galvanometers may be utilized for various purposes. By using two or more coils on the bed, motion of the subject may be noted on the record. A more quantitative estimate of the amount of movement may be made by using several of the galvanometers connected to independent bed coils with varying amounts of current passing through the primaries to give varying degrees of sensitivity of response. In addition, it is possible to use one set of coils at the head and one at the foot of the bed to differentiate head and leg movement on the part of the subject. Due to extreme differences in size of subjects used in this study, such an arrangement was not found feasible and a single coil was used, placed at the middle of the bed. The other magnets were used in automatic marking devices for specific types of stimuli.

Electrical Units

A. Camera and Recorder

The electrical circuits involved in both the camera and recorder units have been discussed somewhat in previous sections and are so simple that further description seems unnecessary.

E. Resistance Bridges for Galvanometer Recording Systems

Since the chief aim of the present apparatus was to provide curves of apparent resistance changes which would be reproducible and comparable, it was considered essential to utilize the substitution method of recording.⁷ In this circuit (Fig. 6) the current through the subject is constant when the bridge is balanced, and slight deviations from balance, as obtained under experimental conditions, produce negligible effects. The two bridges (3, 4, Fig. 1) were built exactly alike with respect to electrical characteristics. Due to the wide range of apparent skin resistances obtained in human subjects, the bridges were built to balance at either 100,000 or 200,000 ohms. Resistances were thus recorded as either 100,000 ohms

⁵ At the suggestion of Professor H. E. Jones, a similar recording system connected with a "manual tensiometer," has recently been placed in a symmetrical position to provide a record of changes in muscular tension. The tensiometer will be described in a subsequent report by Dr. Jack Buel.

⁶ Dr. Jack Buel suggested and designed this system of recording.

⁷ Darrow, C. W. Uniform current for continuous standard unit resistance records. J. Gen. Psychol., 1932, 6, 471-493.

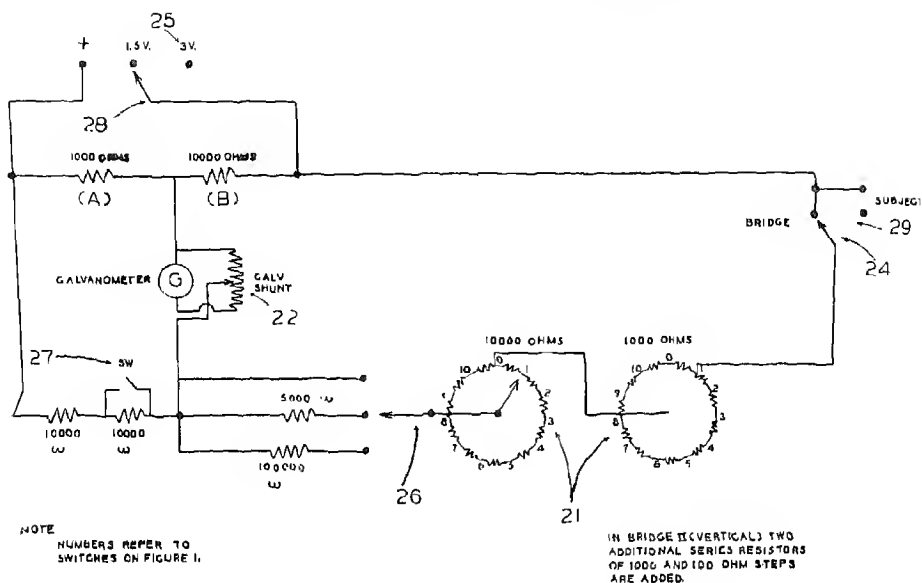


Figure 6
Horizontal Bridge Circuit

or 200,000 ohms minus the amount of resistance in series with the subject at the moment. An impressed E.M.F. of 1.5 at 100,000 ohms or 3.0 volts at 200,000 ohms was used across the bridge, which reduced the current flowing through the subject to about 7.5 microamperes as measured by the microammeter (20, Fig. 1) so that polarization at the electrode was minimized. General Radio Company shielded decade units were used in the series resistors of the bridges (21, Fig. 1). Arryton shunts were built for each galvanometer so that the galvanometer remained critically damped at all intermediate sensitivities (22, Fig. 1).

A short-circuiting switch (23 or 24, Fig. 1) by which the subject is excluded from the circuit, makes it possible to calibrate each curve in 1,000 (or 100) ohm steps so that the resistance changes recorded may be tabulated in standard ohm units, giving a degree of comparability of records not possible when methods other than that of substitution are used. Directions for operation are given in the appendix.

C. Electrodes for Galvanometers

Electrodes consisting of zinc-zinc sulphate solution were used on the hand and foot in the present study. Figures 7 and 8 show the essential construction details of both. Provision has been made to obtain constant conditions of area, moisture, and pressure in each electrode system. In the foot electrode (Fig. 8) the active electrode of 3 mm. zinc, $2\frac{1}{2}$ cm. in diameter (14) slides within a bakelite tube which extends flush with the back board (16) to which the foot is bound rather tightly with a 3-inch bandage. The zinc plate, which is covered with a

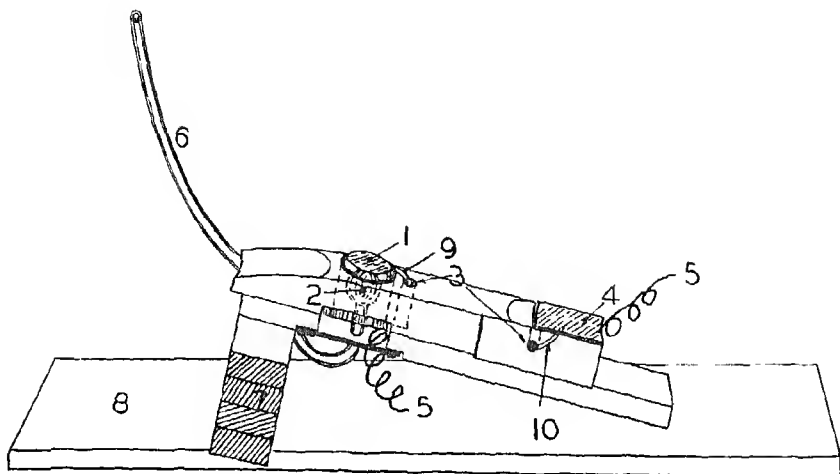


Figure 7

stiff paste of acid-washed kaolin and saturated with zinc chloride and a cotton pad soaked in 0.9 per cent NaCl is held against the sole of the foot by the hydrostatic pressure of a constant head of water (125 cm.) connected by a rubber tube (7) to the rubber balloon (15) lying inside the bakelite tube. The block (2) which is adjustable in the slot (6) for different foot lengths contains a similar zinc plate (3) and balloon (4) arrangement which makes contact with the side of the leg which is bound to the horizontal support (12) by means of long 3-inch bandages. Cotton wicks (16, 17) lead from bottles of water (9, 5) to the cotton pads on the zinc plates (14, 3) to maintain conditions of moisture. The electrode may be adjusted to different foot lengths by sliding the hinged joint (10) in the slot (9) and tightening up a thumb screw at the rear. A cross support (11) prevents the electrode from upsetting on the bed. A spring may also be attached at the outside corners of the two parts (13, 12) to draw the braces up close against the foot and leg to give increased stability to the system. Electrical connections (1, 1) are made to the appropriate binding posts of the Wheatstone bridge. Armored cable, which was grounded, was used in making all the connections from the electrodes to the Wheatstone bridge.

Construction of the Hand electrode (Fig. 7) is similar to that of the foot, but somewhat simpler. The active electrode (1) is pushed against the palm of the hand by the hydrostatic pressure transmitted by the rubber tube (6) to the rubber balloon (2). Contact with the under-side of the arm is made by the indifferent electrode (4) by binding the arm to the rest (7) by means of a 3-inch bandage.⁸

⁸ Mr. F. M. Henry has suggested the use of strips of rubber dam to bind the electrode to the hand.

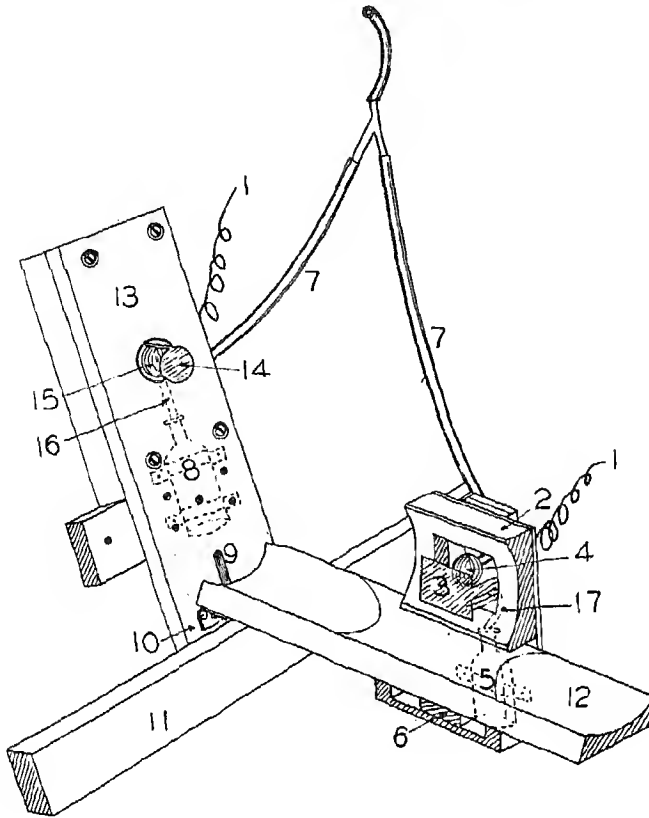


Figure 8

Moisture is maintained by wicks (9, 10) leading from small vials of water (3).

Apparatus Attached to Subject

For the experimental period, the subject lies on a cot inside the stimulus cabinet⁹ with the following apparatus attached:

1. A pneumograph around the chest at nipple level is connected with the recording bellows by copper and rubber tubing.
2. The hand electrode, previously described (Fig. 7) is attached to the right hand, and the foot electrode (Fig. 8) to the left foot.
3. A sphygmomanometer cuff with one tube clamped off is placed on the right ankle and connected to the pressure bulb and bellows of the recording apparatus by means of copper and rubber tubing.

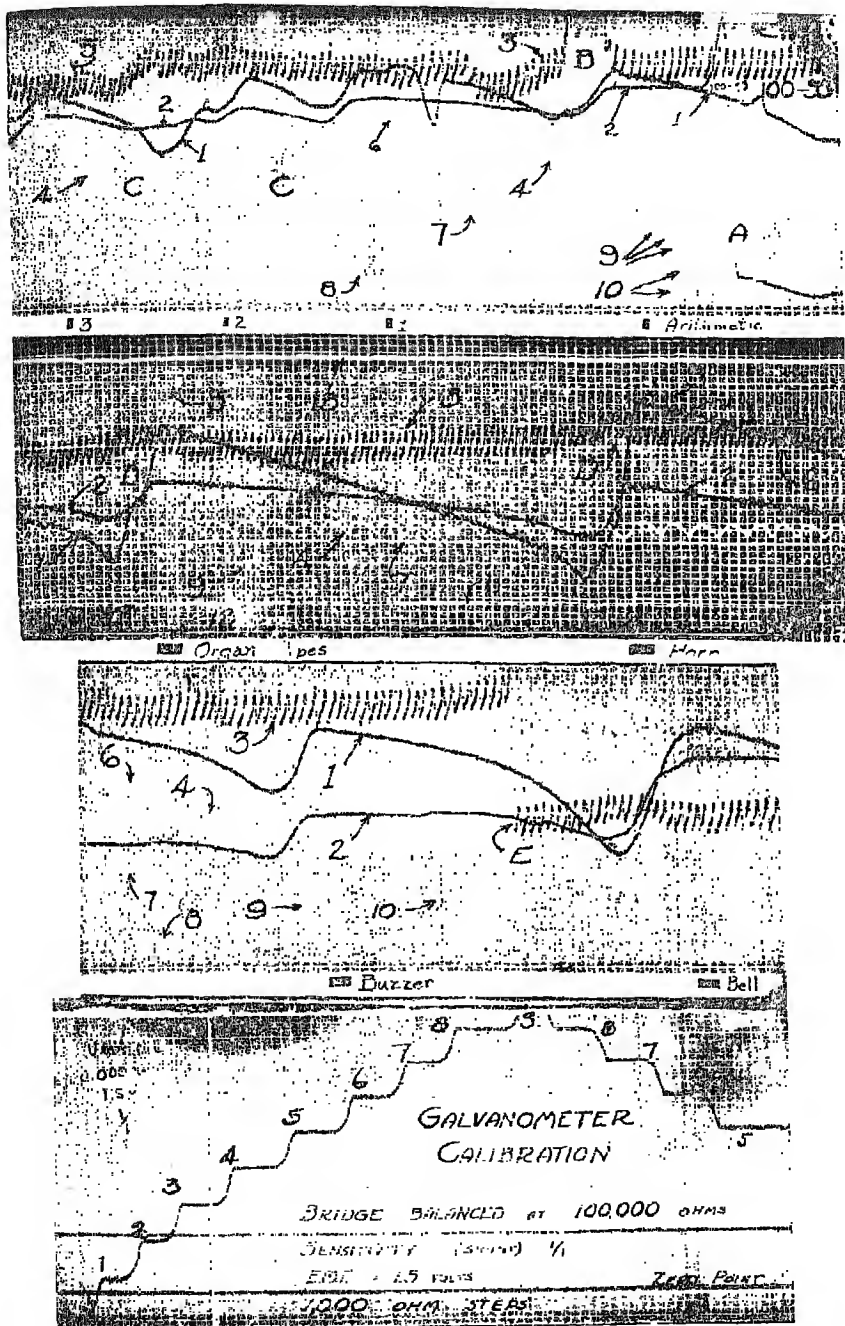


Figure 9

Sample Records

Figure 9 shows a sample record obtained in an experiment. The horizontal white lines (9) are produced by the black lines ruled on the celluloid of the camera aperture, while the vertical lines (10) mark intervals of one second. Pulse rate and relative limb volume changes are shown by the black irregular curve (3). The white dash (11) at the top of the record shows what changes in the resistance base were made, while the black marks (12) on the white margin at the bottom mark the incidence of stimuli. (Note that the record reads from right to left). The white line (4) is the respiration curve. The two dark lines (1 and 2) are the record produced by the galvanometers, showing deflections, which indicate changes in apparent skin resistance produced by the stimuli. A calibration curve with 1,000 ohm steps is also shown. The white wavy line (7) is produced by movements of the pointer of the small galvanometer attached to the bed movement recorder. The fine white line (5) is produced by another of the bank of four Jewell galvanometers at the front of the recorder (51, Fig. 2) and in the present series of experiments was used as a reaction time recorder for the association word lists, and to indicate the timing of auditory stimuli. The two other fine white lines (7 and 8) produced by the other two Jewell galvanometers were also used as stimulus recorders. The heavy white line (13) records movements of the subject's hand on the tensiometer.¹⁰ The sections of record shown in Figure 9 illustrate most of the changes which occur experimentally. At B the effect of foot movement is shown, while at C the effects of sighs and deep respiration by this subject are apparent. At D changes in relative limb volume following stimulation are recorded. At E the pressure in the sphygmomanometer cuff on the subject's ankle was increased 5 mm. of mercury.

SUMMARY

An apparatus has been described which provides continuous simultaneous photographic records of (1) changes in apparent skin resistance at two different points of the body, (2) changes in pulse rate and limb volume, (3) changes in respiration rate and motive volume, (4) changes in inspiration-expiration ratio, (5) alterations in muscular tremor, (6) gross body movement.

In addition, means of measuring association time, gross reaction time to stimuli, and other similar characteristics of the response are provided in the instrument.

⁹ Jones, H. E. An Experimental Cabinet for Physiological Studies of Emotions.

¹⁰ See footnote 5.

AN EXPERIMENTAL CABINET FOR PHYSIOLOGICAL STUDIES OF EMOTIONS

HAROLD E. JONES¹

Laboratory studies of emotional processes have frequently suffered from defective technique in the control of the stimulus schedule and of incidental stimulation. In a series of experiments planned at the Institute of Child Welfare of the University of California, the following requirements were formulated:

1. Objective records of response. The response of various autonomic segments should be recorded photographically in a form convenient for measurement.
2. Instrumental attachments. Provisions should be made for rapid and uniform procedure in the attachment to the subject of electrode, manometer bandage, or other devices required in electrical or pneumatic registry in the investigation of emotions.
3. Control of stimuli. Through electrical and mechanical controls, it should be possible to present emotionally provocative situations in a standardized stimulus schedule.
4. Reproducibility. In a study involving repeated observations, it is particularly necessary that procedure, stimulation, and recording should be reproducible in detail.
5. Comfort of the subject. To facilitate experiments of long duration, the subject should be permitted to recline in a comfortable position and with the possibility of some freedom of movement. He should be protected from unscheduled disturbance due to the recording apparatus or to persons attending to the instrumentation.

It is perhaps particularly true in the study of emotions that external factors which can be standardized may be of little moment in comparison with unstandardizable intra-organic factors. It is also true that in the study of emotions standardization may defeat its own purpose through the requirement of laboratory conditions which in themselves provide a differential emotional stimulation. Moreover, it is of course recognized that laboratory situations are better adapted to the study of episodic emotional states than to the elucidation of emotional trends. Acknowledging these limitations, we still find an important place for laboratory techniques in the study of emotions, and a need for more thorough experimental controls than are ordinarily utilized.

The requirements for the recording equipment, as stipulated above, have been met in an apparatus described by Shock.² In order to meet the remaining require-

¹ From the Institute of Child Welfare, University of California.

² Shock, N. W.: A continuous recorder for obtaining synchronous curves of physiological responses to stimuli in human subjects.

ments an experimental cabinet was constructed, the main features of which are indicated in Figure 1 (interior view) and Figure 2 (external view).

Explanation of Figure 1

1. Housing for concealed camera (used in facial expression portraits).
The camera used is a Leica, with 135 mm. telephoto lens, and also with 50 mm. lens and stereoscopic attachment
- 2,3,4. Battery of colored lights (used in conditioning experiments)
5. Buzzer
6. Automobile horn
7. Buzzer
8. Bell (mounted on the support for the lights)
9. Geissler tube
10. 120-watt lamp, unfrosted
11. Screen for projection of pictures
12. Loud speaker
13. Aperture for film slide projector
14. Aperture for motion picture projector
15. Mounting for electrodes for left foot (for skin conductance measurements)
16. Manometer bandage (for pulse and mean volume records from right leg)
17. Mounting for electrodes for right hand
18. Push button operated by subject (controlling film slide projector)
19. Induction coil (the coil is attached to the frame of the bed, a soft iron core to the couch spring. Movements of the subject on the couch yield a photographic record through galvanometric registry of changes in current passing through the core)
20. Pillows, adjusting the subject's head in a position for photographs from the camera above
21. Sphygmomanometer for clinical blood pressure records (from left arm)

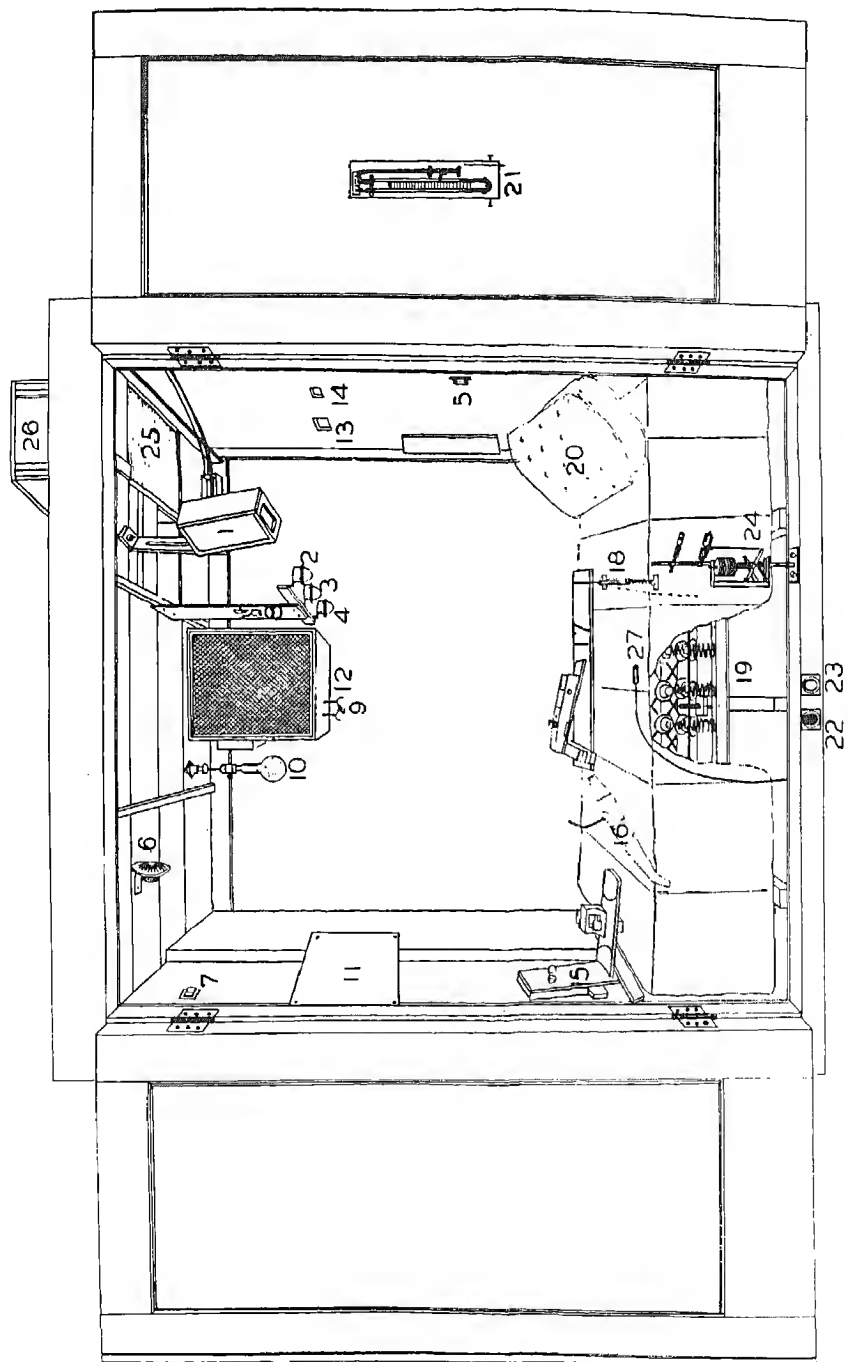


Figure 1

- 22,23. Foot switches used by experimenter to register stimulus signals on the photographic record
- 24. Tensiometer for recording manual pressures
- 25. Diffusing glass
- 26. Lamp housing and chromaloid reflector for two 500-watt lamps

The inside dimensions of the cabinet are 2'10" by 6'10" by 6'10" high. The doors and ceiling are of wood, the sides of celotex. The physical characteristics of the stimuli will be indicated more specifically in connection with individual reports.

Explanation of Figure 2

- 1. Celotex wall of cabinet
- 2. Housing for film slide projector. The projector is enclosed in a wooden box, lined with felt, in order to deaden the sound of the solenoids which control the film movement
- 3. Bell and Howell motion picture projector
- 4. Battery of switches to control lights and auditory stimuli
- 5. Experimenter's winding key to reset Leica camera after picture has been taken. The key operates through a ten-foot flexible extension shaft
- 6. Cable release for camera

The Use of the Cabinet

Up to the present time the cabinet has been used for approximately 1000 experimental periods averaging from thirty to fifty minutes each. The stimulation schedules include a sequence of lights, buzzers and bells; phonograph records which reproduce radio programs and standardized "sound effects" through the loud speaker; a series of short motion picture subjects; a series of single frame pictures exposed through the film slide projector; a series of odors; mental tasks such as arithmetic problems; a deception test; association words; and a series of short-answer interview questions adapted from emotional inventories. Tests are usually given on two successive days, and repeated after a six-month's interval. During stimulation by the physical stimuli, the doors of the cabinet are normally closed and the subject isolated. For the stimuli requiring timed administration by an experimenter (as the association words) one door is opened and the experimenter sits just outside the cabinet. Also mounted outside the cabinet is a phonograph turn-table and vacuum tube system controlling input to the loud speaker in the cabinet. As adapted for use in presenting auditory stimuli, Figure 3 shows a supporting bar (1) with notches for a guide (2) attached to the tone arm. The notches are spaced in such a way as to provide a control over the duration of stimulation: at

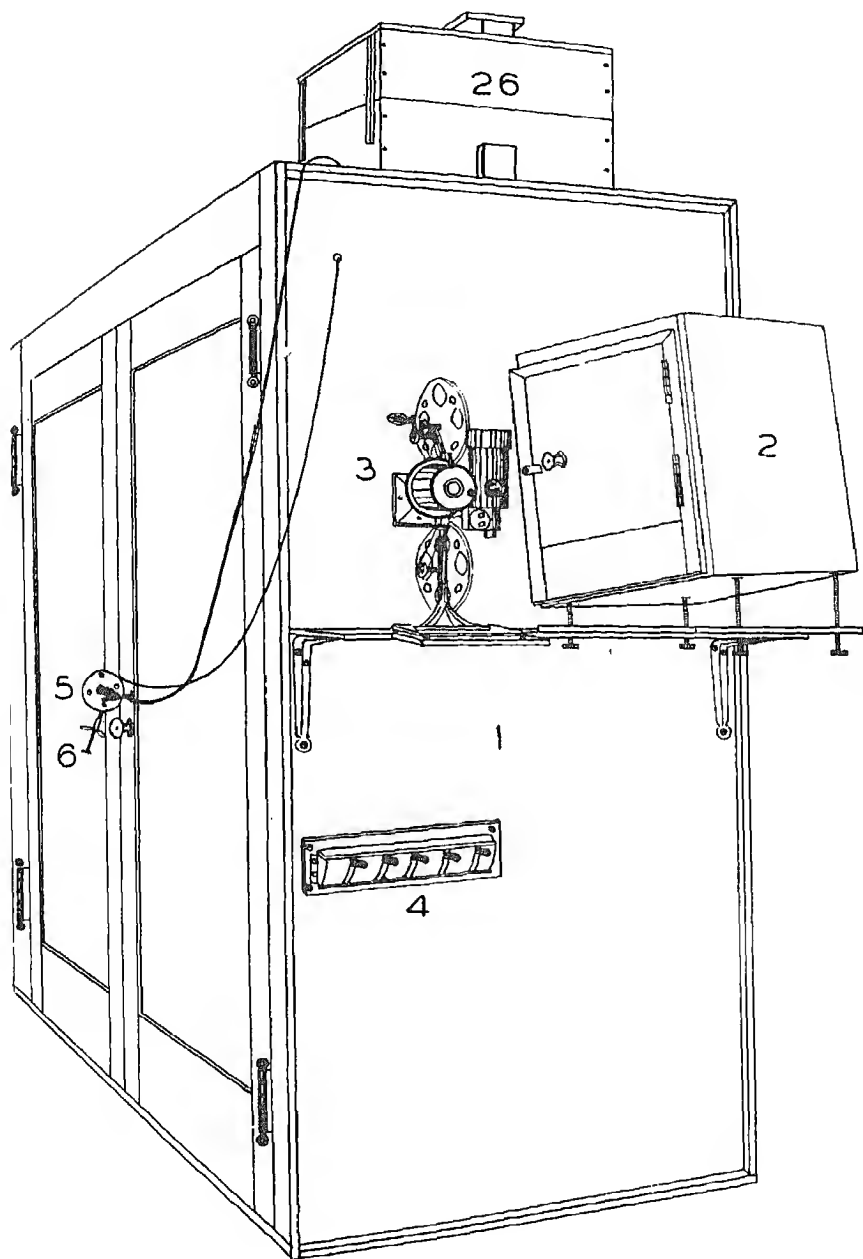


Figure 2

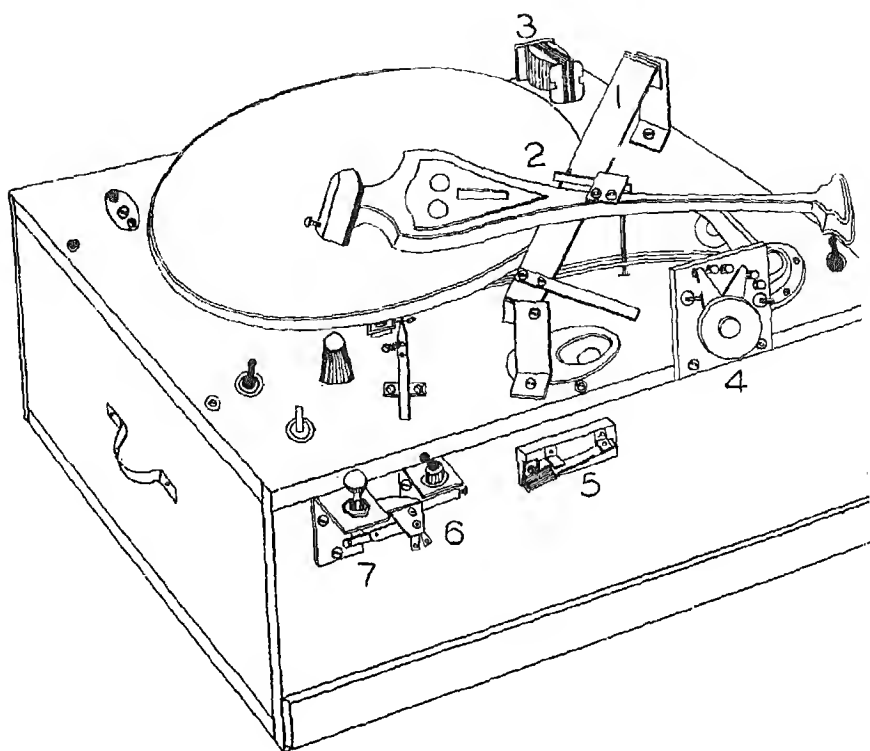


Figure 3

the end of a given part of a record the guide slips into a notch and the next stimulus can be given only after the arm is lifted and advanced; (4) is a supplementary device for auditory stimulation, providing comparatively pure tones through introducing variations in the impedance of a single vacuum tube oscillator circuit; (5) (6) and (7) are control switches.

The equipment illustrated here may at first sight appear to be too complex and unusual to permit of a normal adjustment of the subject; i.e., it may be thought that the initial disturbance produced by this artificial laboratory situation may be such as to overshadow the effects of the specific stimuli. In the case of naive subjects the interior equipment of the cabinet should probably be screened and simplified, and the instrumental attachments reduced in number. This consideration has not seemed to be important in our use of our cabinet, since we were concerned with the collection of cumulative data from subjects who were already familiar with similar equipment before the present series of experiments was undertaken.

The results of a four-year study will be given in forthcoming reports.

"BEHAVIOR MATURITY" OF CHILDREN OF NURSERY SCHOOL AGE

WALTHER JOEL¹

I

Children (and adults as well) display different degrees of "childish" behavior. They have not gained independence from adult help (e.g. in the mastery of daily routine habits); or they have not learned to control their primitive emotional reactions (anger, fear, pain, etc.); or they are not able to cope adequately with social situations. Independence, self-control, and social attitude are the common criteria of grown-up-ness. For this grown-up-ness which is the opposite of childishness I propose the term "Behavior Maturity".

This is a study of behavior maturity in children of nursery school age and of its relation to chronological age and intelligence.

II

As a convenient objective measure of behavior maturity a rating scale was devised. Some twenty situations were chosen to reveal the child's behavior maturity, i.e. his independence in routine habits (eating, washing, etc.), his emotional maturity (attitude in minor injury, etc.), and his social maturity (group play participation, etc.). In each of these concrete situations, there were listed five possible reactions. After considerable preliminary work the following form was evolved.

(The three columns of figures at the left, representing data for 467 children, are here included for convenience.)

Number	Average age (months)	Weight	A. DOES HE DEAL EFFICIENTLY WITH HIS EVERY DAY PROBLEMS? (Routine Habits).
			1. <u>Eating.</u>
96	49.4	7	1. Is always among the first to finish the meal.
134	45.6	5	2. Eats steadily, but is not among the first to finish.
130	44.3	4	3. Needs reminding.
70	42.8	4	4. Is always among the last to finish.
37	47.2	6	5. Shows special difficulties (many food dislikes, complete refusal, vomiting, etc.)
			2. <u>Sleep and Rest.</u>
138	45.4	5	1. Lies quietly at once.
122	46.0	5	2. Does not lie quietly at once, but relaxes without help.
145	46.1	5	3. Needs help to relax.
52	43.8	4	4. Makes disturbance in bed.
10	49.9	6	5. Makes special difficulties (objects to bed, tantrum, etc.).

¹ From Federal Emergency Nursery Schools, Los Angeles, California.

RATING SCALE (Continued)

Number	Average age (months)	Weight	
3. <u>Toilet.</u>			
251	49.8	9	1. Always goes independently to toilet when necessary, without being told.
61	45.0	5	2. Occasionally needs reminding.
74	45.4	5	3. Asks to go, as necessary.
65	34.5	1	4. Goes when called.
16	31.3	1	5. Wets himself (this does not refer to bed-wetting).
4. <u>Removing Wraps.</u>			
100	49.5	7	1. Removes wraps without being told.
165	49.5	8	2. Removes wraps promptly when told to do so.
90	46.4	6	3. Dawdles if not supervised.
88	37.2	1	4. Needs assistance to remove wraps.
24	32.8	1	5. Does not remove wraps by himself.
5. <u>Washing.</u>			
141	49.8	8	1. Washes hands independently without reminder, whenever necessary.
139	47.6	6	2. Works promptly when told to wash hands.
125	45.0	5	3. Needs supervision (washes himself).
57	33.7	1	4. Needs assistance (does part of the work himself).
5	31.2	1	5. Needs to be washed (does none of the work himself).
B. IS HE LEARNING TO LIVE WITH HIMSELF? (Emotional Maturity).			
6. <u>Did his initial adjustment to the school indicate emotional maturity?</u>			
120	47.8	6	1. From the first day at school he fitted into school life, joined group play, without emotional disturbance.
127	46.2	5	2. Stood apart from other children, but showed no emotional disturbance.
116	43.7	4	3. Cried and was unhappy for two or three days.
77	45.5	5	4. Cried and was long unhappy.
27	43.3	4	5. Still makes an emotional scene whenever parent appears at school.

RATING SCALE (Continued)

Number	Average age (months)	Weight	
			7. <u>Does his usual mood show a state of satisfactory adjustment?</u>
73	47.4	6	1. Is never unhappy.
219	45.2	4	2. Is seldom unhappy (only when tired, for example).
108	45.8	6	3. Is easily made unhappy but quick to restore.
63	45.5	5	4. Is easily made unhappy and slow to restore.
4	44.3	5	5. Is usually unhappy (whines, sulks, etc.).
			8. <u>How does he face his difficulties?</u> (for example, when crossed).
58	50.9	7	1. Calmly, peacefully settles difficulty without appeal to adult (or older brother, etc.).
107	45.3	5	2. Makes a fuss, but settles difficulties without appeal to adult.
190	46.0	5	3. Attempts to settle difficulty, but also appeals to adult.
100	43.0	4	4. Does not attempt to settle difficulty; appeals to adult for help.
12	41.9	4	5. Tantrum.
			9. <u>For how long can he be absorbed in an activity?</u>
41	52.7	8	1. Returns to an unfinished activity of the previous day, continues and develops it.
103	48.4	7	2. Pursues an activity until it is finished and is not disturbed by other attractions, but does not return to it from one day to the next.
193	45.8	5	3. Stays with one activity until something more interesting comes up (goes from one constructive activity to another).
76	42.3	3	4. Often interrupts a constructive activity without taking up another one.
54	39.9	3	5. Shifts aimlessly about.

RATING SCALE (Continued)

Number	Average age (months)	Weight	
			10. <u>Can he play by himself?</u>
53	42.8	4	1. Is so self-sufficient that he plays happily alone, even when excluded by the group.
103	41.3	3	2. Plays happily alone, even voluntarily leaves group.
177	48.0	7	3. Prefers group, but in absence of other children can play happily alone.
98	47.9	6	4. Needs the group and always joins the group.
36	45.0	5	5. is dependent on adult (uses such phrases, for example, as: "Watch what I do," "Look at me").
			11. <u>Is his emotional expression ADE- QUATE (directed) or DIFFUSE (irra- diating)?</u>
151	46.2	5	1. When emotionally disturbed, he expresses himself immediately against the person or object involved, and then is through with the disturbance.
137	45.5	5	2. His disturbed condition, although immediately expressed, persists somewhat, without however spreading throughout the situation (for example: he talks about it).
106	45.0	5	3. Expresses his emotional state immediately, but the disturbance spreads through the entire situation (if the disturbance occurs, for example, in a play situation, he remains disturbed throughout that situation; if in the orange juice situation, he remains disturbed throughout that situation, etc.).
67	45.3	5	4. Acts inconsistently: at times he discharges his disturbance immediately, at times he carries it over.
6	55.2	8	5. Carries over the disturbance for the whole day against anybody or anything (sulks, etc.).

RATING SCALE (Continued)

Number	Average age (months)	Weight	
			12. <u>Does he take responsibility for his actions?</u>
			When punished:
91	47.3	6	1. Takes his punishment calmly without comment.
208	44.5	4	2. Dislikes punishment but takes it.
51	44.9	5	3. Is resentful ("I'm going to hit you," "I don't like you") but acknowledges guilt.
102	47.1	6	4. Is emotionally disturbed (argues, blames somebody else, never admits himself in the wrong).
15	42.3	4	5. Tantrum.
			13. <u>How does he control himself in a minor injury?</u>
94	47.1	6	1. Pays no attention and goes about his business without any fuss.
100	46.6	6	2. Is disturbed (for example, hits or scolds the object or person that hurt him) but calms down without appeal to anybody.
114	44.9	4	3. Appeals for help only if adult is in sight.
88	46.5	6	4. Behavior varies a great deal (at times he pays no attention, at times he is disturbed, at times he needs help to calm down).
71	42.9	4	5. Is greatly disturbed (cries, talks about it, etc.) and needs help to calm down.
			14. <u>How does he behave in the face of a difficult task?</u>
53	48.4	6	1. Perseveres calmly without appeal to adult until he reaches his goal.
192	46.0	5	2. Keeps trying in spite of failures, but finally gives up without getting emotional.
75	45.8	4	3. Keeps trying in spite of failures, but finally gets emotional and gives up (cries, slams, uses "naughty" language).
119	44.8	4	4. Discouraged by failure, he gives up at once.
28	45.2	5	5. Does not attempt at all ("That's too hard for me," "I don't know that," etc.).

RATING SCALE (Continued)

Number	Average age (months)	Weight	
			15. <u>Does he show initiative?</u>
142	48.1	7	1. Chooses his own occupation irrespective of what others do; gets materials, if accessible, without appeal to adult.
82	46.8	6	2. Chooses his occupation irrespective of what others do, but asks for materials.
167	44.6	4	3. Chooses an activity which is already in progress.
27	41.5	3	4. Must be told what to do.
29	41.6	3	5. Rarely occupies himself with anything.
			16. <u>What degree of social maturity is shown in his play with other children?</u>
29	58.2	9	1. Is socially occupied with games that have rules (hide and seek, etc.).
183	49.3	8	2. Plays simple imitative games in which each child has a special role (house, store, bakeshop, fire-engine, train, etc.).
153	44.5	4	3. Participates in activities in which all do the same thing, that is, in which they play no different roles (block building, sand play, running races, etc.).
85	37.6	1	4. Plays in but not of the group (parallel activity, watching, etc.).
17	37.8	2	5. Has no contact with the group.
			17. <u>How much strain can his social attitude bear?</u>
110	46.6	6	1. Is never unkind, not even to children with whom he quarrels.
74	46.8	6	2. His social attitude breaks down only when he is nervous or tired.
200	44.4	4	3. Is usually kind except when crossed.
59	47.9	6	4. Is unkind if not supervised.
24	44.0	4	5. His attitude is not social (he is spontaneously unkind, even cruel).

RATING SCALE (Continued)

Number	Average age (months)	Weight	
			18. <u>Does he see another's viewpoint?</u>
57	49.3	7	1. Applies "fair play" of his own free will, even where it affects him adversely (he takes turns, cooperates, shares even favorite toys and even with children who are not his special friends).
98	50.9	8	2. Takes turns, etc., of his own free will, with friends only.
210	43.1	3	3. Is willing to take turns, etc., but only when he is reminded by adult.
75	45.3	5	4. When reminded by adult, he sulks but takes turns, etc.
27	40.3	3	5. Even when reminded by adult, he refuses to take turns (argues, cries, tantrum, etc.).
			19. <u>How does he react to unfriendly advances of other children?</u>
64	48.5	6	1. Remains calm and does not appeal to adult.
135	45.1	5	2. Gets emotional (fights, cries, shouts, uses "naughty" language), but does not appeal to adult.
205	46.4	6	3. Appeals to adult, but does not run away.
58	42.6	4	4. Runs away (evades the problem).
5	36.0	2	5. Tantrum.
			20. <u>What is his place in the group?</u>
33	54.4	8	1. Initiates group play; always assumes leadership.
120	49.8	7	2. Initiates group play, but is not always leader (he assumes leadership, for example, in certain restricted activities or in certain restricted groups).
179	45.4	5	3. Is neither leader nor follower (does not assume leadership, but makes himself felt in the group).
100	41.8	3	4. Is always a follower; rarely gets attention from the group.
35	36.5	2	5. Has no contact with a group.

Rate the Child As He NOW USUALLY Reacts

The advantages of this rating scale may be summarized as follows: Not abstract traits are rated, but concrete types of behavior; the rating thus becomes at once easier and more reliable. Ease of rating and reliability are also served by the use of definite statements of specific reactions, instead of such vague terms as "poor", "fair", "average", etc. Another advantage lies in the delay of all comparison until after the rating; the child is rated as he behaves, not as compared with the behavior of other children.

III

The subjects were 230 boys and 237 girls from twenty-two Federal Emergency Nursery Schools and one private school. They ranged in age from twenty to eighty-five months. Only one child was under twenty-three and only six children were older than sixty-seven months. The mean C.A. of the group was 47.2 months.

The children were rated by the nursery school teachers according to the following directions:

Directions. 1. Before the rating, each teacher should read the scale and, with its contents well in mind, observe the children for one week.

2. After a week's observation, the rating should be done jointly by the teachers at a conference.

3. Children who have attended the Nursery School for less than four weeks should not be rated.

4. Start with the first item ("Eating") and rate all children on that item. Then, rate all children on the next item ("Sleep and Rest"). Do the same with the other items of the scale.

5. Make a circle around the number preceding that statement which most nearly describes the child's usual behavior, according to the consensus of opinion of the teachers.

6. Rate the child without reference to his age, his former behavior (except Item No. 6), or any other special consideration.

7. Do not omit a single item. The teachers together should arrive at a rating on every item for every child.

The four weeks minimum attendance requirement serves a twofold purpose. It enables the teachers to become familiar with the child's reactions and gives the child time to overcome any possible initial adjustment difficulties.

The method of joint rating was preferred to independent rating, because the results from the preliminary form of the scale on which the children had been rated on separate blanks by the several teachers had shown a rather close agreement among the different raters. In cases of discrepancies the process of averaging the independent ratings would not produce a more accurate picture of the child, but

would rather make the rating meaningless. A thorough discussion, on the other hand, at each point of disagreement would bring about a more reliable rating.

IV

The term behavior maturity implies the concept of growth or development in time. Hence the natural criterion for validating the rating scale is C.A. An inspection of the average C.A. for each single rating (second column at the left of the rating scale) does actually reveal some relationship between C.A. and the rating steps. Thus, in 15 of the 20 items the children rated "1" had a higher average age than those rated "2", "3", "4", or "5". In 16 items the children rated "5" were of lower average than those rated higher than "5". The average age of children rated "1" and "2" drops below 45 in only one item each, while the average age of children rated "4" and "5" rises above 45 months in only three and four items respectively. The average age of children rated "3", on the other hand, stays between 44 and 46 months, with the exception of two items.

It can also be seen that the ratings on items 3, 4, 5, 8, 9, 10, 15, 16, 18, and 20 differentiate well between behavior at different age levels, and that the ratings on items 1, 2, 7, and 11, on the other hand, contribute less to the measurement of behavior maturity.

For a validation of the scale as a whole, the C.A. of a random sample (the first 117 children) was correlated with the total raw score¹; the coefficient of correlation was $r = .37$. By means of the bi-serial r method, regression weights for C.A. were computed and the total weighted score of the sample was correlated with C.A. The coefficient of correlation was $r = .72$. To test the reliability of these weights, another sample in which the weights had not been determined was used (the next 107 children). The correlation of C.A. with total raw score was .49, with total weighted score (using the weights of the first sample) .71. This result proved the usefulness of the weighting method. A new set of regression weights was then computed, based on the total group of 467 children². The data were weighted and the total weighted score was correlated with C.A. The coefficient of correlation between total weighted score and C.A. for 467 children was $r = .65 \pm .02$. Considering the crude nature of a five-point rating scale, this correlation indicates that the scale is a good measure of behavior maturity.

In order to obtain age norms, the total weighted scores of 467 children were distributed by C.A. Scores and C.A.'s were equated on a percentile basis. The preliminary "Behavior Maturity Age" thus obtained for each child was divided by his C.A. The quotient is called "Behavior Maturity Index". The curve was then empirically smoothed so that the median Index for any given C.A. level approximated 100, and after further extrapolation the following age norms were obtained:

¹ The writer is much indebted to Mrs. Alice M. Horn for her assistance and expert advice on the statistical procedure.

² These weights are shown in the third column at the left of the scale.

Total weighted score	Behavior Maturity Age (months)	Total weighted score	Behavior Maturity Age (months)	Total weighted score	Behavior Maturity Age (months)
71	19	91	35	111	51
72	20	92	36	112	52
73	21	93	36	113	53
74	22	94	37	114	55
75	23	95	38	115	56
76	23	96	39	116	57
77	24	97	40	117	58
78	25	98	41	118	60
79	26	99	41	119	61
80	26	100	42	120	63
81	27	101	43	121	64
82	28	102	43	122	65
83	28	103	44	123	66
84	29	104	44	124	67
85	29	105	45	125	69
86	30	106	45	126	71
87	31	107	46	127	72
88	32	108	47	128	78
89	33	109	48	129	79
90	34	110	49	130	80

V

The close relationship of behavior maturity (as measured by this scale) with chronological age might arouse the suspicion that the child's intelligence is an important factor in determining the rating. To clear up this question, I.Q. and Behavior Maturity Index were correlated for 88 children who had been previously tested by the writer with the California Pre-School Mental Scale and who ranged in I.Q. from 60 to 145. The coefficient of correlation obtained was $r = .036$ and indicated that intelligence, as measured by the California Pre-School Mental Scale, did not influence the behavior maturity ratings. This is true, at least, for the group as a whole. It is possible, however, that children of low I.Q. cannot achieve high behavior maturity ratings, while children of average and superior intelligence may be rated low as well as high on the behavior maturity scale. Our data seem to show this tendency but are not sufficient to prove it.

Behavior Maturity Index	California Pre-School Mental Scale I.Q.									
	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	
60-69					1	1		1		
70-79	1					3		1		
80-89		1	2	3	4	5	1	1	2	
90-99		1		4	4	4	4	1		
100-109				1	9	2	1	3		
110-119		1		2	7	2	2			
120-129				1	3	1	1	1		
130-139					2	1				
140-149								1		
150-159										
160-169										
170-179					1					
180-189							1			

VI

SUMMARY

1. Behavior maturity is defined as grown-up-ness or, more specifically, as the degree of independence, self-control, and social attitude reached.
2. A rating scale is presented which may serve as an objective measure of behavior maturity in children of nursery school age.
3. 467 nursery school children with a mean C.A. of 47.2 months were rated. Regression weights for age were computed. The coefficient of correlation of total weighted score with C.A. was $r = .65 \pm .02$.
4. Age norms and scoring key (weights) are presented.
5. The coefficient of correlation between California Pre-School Mental Scale I.Q. and Behavior Maturity Index was found to be $r = .036$.

INTERRELATIONS BETWEEN THE PRESCHOOL CHILD'S BEHAVIOR
AND CERTAIN FACTORS IN THE HOME¹

BERTA WEISS HATTWICK

Those of us who work daily with preschool children have learned that we cannot understand or deal adequately with their behavior unless we know something about their lives at home.

"Is the home a clean, well-regulated one?" "Does it provide the child with sufficient opportunities for play and social contacts?" "Does it give the child the affection and security which he requires?" "Does it give him a chance to help himself?"---It is such questions as these that the preschool specialist has learned to ask. The answers are seldom very specific, for there are few facts available on the relation between specific situations in the home and specific types of behavior in the school. Such knowledge as is available has been gleaned largely from personal experiences. Research has lagged far behind practice in the attempt to seek relationships between the average child's behavior and the life he lives at home.

One reason for such a lag is obvious: there are so many variables in home situations and in children's experiences outside the home that we cannot expect to find invariable relationships---and hence to make predictions with any degree of accuracy---between a given type of behavior in a particular child and a given home factor. In our practical work we shall always need to deal with individual cases and any research which attempts to provide a substitute for this will undoubtedly be doomed to failure.

It does happen, however, when one is working with a large number of individuals, that certain types of behavior tend to occur more frequently in relation to some home factors than in relation to others. Such results as these can be extremely helpful to us if we look upon them not as substitutes for individual analyses---not even as predicting devices---but rather as tools to be used in achieving a speedier and more effective approach to the understanding of the individual case. Such results may be thought of as clues which it will usually be worth our while to refute or verify before we seek other explanations for a particular child's behavior.

The present study was undertaken for the purpose of discovering some of these most frequent relationships between preschool behavior and certain factors in the home. Data on 35 common types of preschool behavior and on 15 home factors which are generally thought to be pertinent to the child's behavior were secured on 335 subjects, all between one year, eleven months and five years eight months of age. Tetrachoric inter-correlations were used as the basis for comparison between the two sets of data. The results rather naturally fall into three large divisions:

¹ From Winnetka Public School Nursery. Paper based on data from the behavior and home settings of 350 nursery school children. The writer wishes to acknowledge the cooperation and helpful suggestions given by Rose H. Alschuler, Director of the Winnetka Public School Nursery and the Chicago Nursery Schools operating under W. P. A. It was this cooperation which has made the study possible.

1. Comparison of behavior under home conditions suggesting over-attentiveness with behavior under home conditions suggesting irresponsibility or negligence.
2. Comparison of behavior under conditions suggesting a well-adjusted home with behavior under conditions suggesting tensions in the home.
3. Study of behavior in relation to situations (a) in which children share home responsibilities with their parents and (b) in which children and parents have common play interests✓

The specific items included in the above divisions are indicated in the following pages (see p.204). These items are far from being exhaustive measures of forces operating in the home. Neither do they include all items represented on the home data sheet. They do include all data which on the basis of numbers and reliability seemed adequate for detailed study.

GENERAL STATUS OF THE PROBLEM

Although numerous and diversified opinions may be found as to the relationship between children's behavior and home factors, research studies have scarcely tapped the field. Those studies which have been carried on have dealt largely with children who were above the preschool level and who belonged to the "delinquent" or "clinic" rather than to the "normal" group. They are cited here, nevertheless, for the light which they can throw on the general status of the problem.

Studies to date are agreed in indicating that home factors are important determinants of good and poor adjustment in children. They have also defined the general forces which contribute to mal-adjustment. Stoddard (9) in a report before the National Research Council's Committee on Child Development lists these as follows:

1. Economic handicap
2. Physical handicaps
3. Mental retardation
4. Racial handicap
5. Broken home
6. Parental ignorance and indifference
7. Chronic illness in family
8. Chronic intoxication (or drug addiction) in family
9. Family tensions
10. Parental domination
11. Parental over-solicitousness
12. Minority group handicap
13. Bad companions

While this list is not considered conclusive, Stoddard states that "one can conceive of a search for mal-adjusted children outside all of these categories as a rather difficult affair." (9, p. 2, appendix F.)

Other studies have gone one step further in that they have indicated the relative significance of the factors listed above in the adjustment of the child. Francis and Fillmore (4), for instance, found that parent attitudes are more important determinants of adjustment than are such tangible conditions as economic handicaps, broken homes, foreign born parents and physical sickness. Ward (10) placed economic insufficiency and poor neighborhood at the end of her list of the 10 most adverse factors in the home background of 100 only children referred to a guidance clinic. Louise Stanley (12) in a summary of this topic before the White House Conference said,

✓ "Environmental factors in juvenile delinquency have been studied by various agencies with an increase in our knowledge of predisposing causes of delinquency. However, the fact remains that good children grow up side by side with the delinquent in the same environment, and often in the same family there are well-adjusted and poorly adjusted children. The deciding factor must be in the interplay of personality in the family group." (p.135) ✓

Burgess (1), as a result of his study, and Ogburn (7) have drawn conclusions similar to the above.

Few investigators as yet have taken the next obvious step; i.e., have attempted to tie-up specific home factors with specific types of behavior. All of the investigators previously referred to, for instance, have compared home factors with "good" or "bad" adjustment on the part of children. Some still feel that a search for more specific relationships is fruitless. (13)

It seems to the writer that this is not necessarily the case. As indicated above, even trends toward specific relationships should be useful if accepted for what they are worth. Furthermore, even though the same behavior may be due to quite different and even adverse causes in two different individuals, there is still a chance that the constellation of behavior traits may be distinctive in the two cases and may yield helpful clues. Certainly more attempts to discover specific relationship between behavior and home factors are necessary if we are to clarify our thinking and to hope for findings which will be functional in preventative, diagnostic and remedial work.

The present study represents one attempt to relate specific home factors to specific types of behavior in the child. The few published studies of this sort are not discussed at this point since they seem to fit more advantageously into following sections.

SOURCE OF MATERIAL¹

Subjects

The subjects of the present study were 335 children (171 girls and 164 boys) from 18 different nursery schools. The children ranged in age from 1 year, 11

¹ A more detailed description of this entire section is filed among the records of the Winnetka Public School Nursery.

months to 5 years, 8 months with the median at $3\frac{1}{2}$ years. The group contained 146 children of American (white) descent, 100 children of Negro parents and 89 children of foreign (mostly Mexican, Italian, mixed European) extraction.

An analysis was made of the fathers' occupations in the case of the 301 children for whom such information was available. These results were compared with the United States census figures of 1920. There were more families in each of the two upper occupational levels (professional and semi-professional classes) in the case of the experimental group than in the case of the population at large. None of the experimental group fell in the fourth occupational classification (farmers). Except for these differences there was striking similarity between the two distributions. The exact proportions follow:

Occupational Levels	Distribution by Occupation (%ages)	
	Present Study (301 cases)	U.S. Census Report 1930
I. Professional	8.93	2.6
II. Semi-professional	9.25	7.2
III. Clerical	15.28	13.8
IV. Farmers		15.4
V. Semi-skilled	24.93	23.8
VI. Slightly skilled	19.93	14.5
VII. Day Laborers	20.60	22.7

Data

The data on both preschool behavior and home factors were secured, in terms of frequency of occurrence, on specially devised rating sheets. Behavior was rated in terms of how frequently it had occurred in the past month: "never," "less than once a week," "once a week," "several times a week," "daily or more." In the statistical analysis the two-fold division was made between the third and fourth of these five categories. For home factors a judgment of "never occurs," "sometimes occurs" and "usually occurs" was required. In the statistical analysis only the two groupings, "never" and "usually," were considered.

The behavior ratings for each child were based on an average of three independent ratings by teachers who were in daily contact with the children. Ratings on the home factors were based on the judgments of one teacher alone. The latter procedure was followed since each teacher in the 18 nursery schools was accustomed to assume responsibility for certain homes and was consequently a better judge of the homes on her list than was any of the other teachers in the group.

On the sheet for rating home factors each teacher was asked to indicate (a) the number of conferences and home visits she had had with each parent and (b) whether she was very sure, moderately sure or not sure of each judgment. Only those ratings were used in which the teacher had reported at least one home visit (usually there were several) in addition to school conferences. Only ratings were used in which the rater was very sure or moderately sure of her judgment.

On items involving personality traits of the parents, each parent was rated separately. In the following analysis the data based on such traits are limited to mothers alone. Sufficient material was not available for the similar analysis of fathers. Such data are being collected, however, so that future analyses of this type may be made.

Since distribution of ratings is an extremely important factor in tetrachoric correlations, the number of records falling in the "usually" and "never" groups in the case of each of the home traits is indicated below. The number of cases falling into the two groupings used for the behavior sheet are not presented here but have been placed on file in the Winnetka Nursery unit:

Classification	Occurrence		
	Never	Usually	Total
Mother favors child	81	100	181
" over-solicitous	135	33	168
" babies child	112	40	152
Household revolves around child	154	81	235
Mother irresponsible	186	47	233
" negligent	190	51	241
Home calm	73	111	184
Mother cheerful	17	170	187
" fatigued	116	27	143
" ill	144	25	169
" nervous	147	31	178
" impatient	111	26	137
" quarrelsome	96	14	110
Child shares home work	72	133	205
Child shares play	42	175	217

Reliability of Material

The reliability of each teacher's ratings was determined on both forms by comparing judgments made on the same children one week apart. The agreements for the behavior sheet (based on an average of 104 judgments each) ranged from 73 to 96% for the individual teachers with a median of 85%. The agreements for the home rating sheet (based on only 17 judgments each) ranged between 80 and 100%. For the entire set of data used in determining reliability (221 items) the agreement on the home data sheet was 94.6%.

Validity

In the case of behavior ratings, the agreement of an individual teacher with the average of three could be used as one check on validity. Such a comparison (based on 69 to 157 judgments for each teacher on a random sampling of traits) yielded a median agreement of 89%. The agreements ranged from 77 to 98%.

Since validity might easily be greater for some traits than others, the agreement of individual teachers with the average of three was secured for each behav-

ior trait on a random sampling of the data. Agreements of 71 to 80% were obtained for "seeks attention by showing off," "asks unnecessary help," "seeks praise," "wastes time at routines," "leaves tasks incomplete," "daydreams." Agreements of 90% or above were found for "sucks thumb," "fears," "hard to reason with," "shrinks from notice," "jealous," "has temper outbursts," "breaks toys," "tells fanciful stories," "misrepresents facts." The relatively larger number of judgments of "never" which occurred in these types of behavior probably explains the higher agreement found here. Agreements for the other types of behavior ranged between 80 and 90%.

The check on validity used above was not available in the case of the home data sheet. Internal consistency has therefore been used as the main check on the validity of this material. For each of the larger home factors studied, such as over-attentiveness, several separate approaches have been made, and parallel analyses of results have been presented. The exact comparisons will be found in the description of findings. It is sufficient to state here that none of these various approaches, within a given larger grouping, yielded contradictory results.

As a working criterion of validity on the home data sheets, each teacher was also asked to give her own definition of the traits which she rated. Typical definitions are given in each section of the report. No statistical analysis was made of these definitions. In general, however, the teachers were well agreed on the meaning of the terms employed.

Stability of Factors on Home Data Sheet

Unless the traits listed on the home data sheet remain characteristic of the home over a period of time, they cannot be expected to exert a very lasting effect on the behavior of the child. For this reason it was of interest to know how much agreement would be found between ratings made six months apart by the same teacher on the same home. The number of homes available for such a comparison was only 43. Agreements for this small number of cases (when based on the two-fold classification used in the treatment of results) ranged from 81% in the case of parent over-solicitous to 100% in cases of parent ill, parent impatient, parent irresponsible.

Treatment of Data

All of the comparisons presented in the following pages are based on tetrachoric correlations between the home traits--- divided into the two groups "never" and "usually"---and the children's behavior---divided into the two groups "occurs once a week or less" and "occurs several times a week, daily or more."

In interpreting these results an 'r' of less than .20 has been considered insignificant. A correlation which lies between .20 and .50 has been taken as an indication of a definite, though low, relationship. It should be noted that in a study of this kind, with its large number of uncontrolled variables, a correlation of .20 to .50 probably has more than its usual significance from a practical standpoint.

Probable errors are not presented with the correlations in the following tables. This is because probable errors for tetrachoric correlations do not justify themselves in the light of (a) the general doubtfulness as to their significance and (b) the relatively great amount of labor which they involve. In order to give the reader some basis for estimating the applicability of the present findings, however, a group of sample probable errors was secured. These indicated that a coefficient of .30 or above, based on 170 cases, is in general statistically reliable in the present set of data. Coefficients of .20 to .30, based on the same number of cases, fall just short of this criterion, an indication that the same results would probably, but not invariably, be found in another sampling.

Since the reliability of tetrachoric correlations is partially dependent upon the proportion of the total cases falling in each category, such information should be included in any complete presentation of the study. These data proved too unwieldy for inclusion here, however, and have consequently been placed on file at the Winnetka Nursery Unit. The frequency of parent characteristics (p.204) gives a partial picture of this distribution.

I. OVER-ATTENTIVENESS IN THE HOME

Four traits were listed on the Home Sheet which would seem to characterize over-attentiveness in the home. These traits, with typical definitions given by the teachers at the time of rating, follow:

1. Parent favors child: Parent "gives in to the child whether he is right or wrong." Parent "lets child have own way."
2. Parent is over-solicitous: parent "expresses concern over trifles, is over-anxious."
3. Parent treats child as baby: Parent "doesn't let child do things he could do for himself." Parent "makes unnecessary choices and decisions for the child."
4. Household revolves around child: "Child is given first consideration in everything." "Everything at home is planned with the child in mind." ¹

As the definitions show, the four traits do not necessarily represent ways of saying the same thing. The distinctions seemed quite clear to the teachers in the case of the first three categories. The meaning of the fourth category was more open to question and it, therefore, cannot be interpreted as safely as the rest.

While the four categories are not identical, they would seem to have the element of over-attentiveness in common. To determine whether there is any marked relation between the traits as rated by the teachers, the following tetrachoric inter-correlations were obtained:

¹ Note: This might be true of the sensible, well-planned household without over-attentiveness entering in at all. Such a possibility might account for the lower inter-correlations of this trait with others in the group.

	Mother Favors ¹	Mother Babies ¹	Mother Over-Sol. ¹	Child Cen- ter of Home
Mother Favors	--	.83	.61	.56
Mother Babies	.83	--	.91	.58
Mother Over-Sollicitous	.61	.91	--	.75
Child Center of Home	.56	.58	.75	--

¹ The data on favoritism, babying, and over-solicitousness are based only on mother ratings since sufficient data on fathers were not available for classification in this way.

The tabulations reveal definite, high relationships between the four categories. In other words these traits, as conceived by the teachers, do have something in common. It seems safe to assume that over-attentiveness is the common element involved.

The high inter-relationship noted above made it seem fruitful (a) to secure parallel comparisons of preschool behavior in relation to each of the four groupings and (b) to analyze this material particularly for similar trends. Inasmuch as the four groups are not identical, some variability in results is to be expected. In the present analysis, however, it is the consistent trends which will be emphasized, since it is these which suggest that over-attentiveness is operating.

Correlations on the three maternal traits---favoring the child, babying the child, being over-sollicitous in care of child---are presented separately for the reasons given above (i.e., so that consistency of trends may be used as a check on validity.) In order to secure a more convenient summary of the relation of maternal over-attentiveness to behavior, however, correlations based on a combination of these traits are also given.

Data on paternal over-attentiveness are not given here since sufficient material was not available for such analysis at the time of this writing. More data are being collected, however, and it is hoped that a report on paternal attitudes will be available in the future.

The Findings

Table I contains the tetrachoric correlations between the various measures of over-attentiveness and the 35 common types of preschool behavior for which correlations were obtained. Several types of behavior which were on the inventory were not included in this report because they did not occur frequently enough to justify statistical analysis. Enuresis, speech difficulties and daydreaming are examples of behavior excluded for this reason. Behavior was grouped under the heading "tendency toward + relationship" if: (1) one or more of the home factors with which it was correlated yielded an 'r' of .20 or above; (2) the majority of the correlations were positive in nature; or (3) there were no negative correlations sufficiently high (.20 or above) to contradict the positive finding. The same reasoning holds for other classifications in this and in following tables.

TABLE I

Relation of Preschool Behavior to Various Measures
of Over-Attentiveness in the Home

BEHAVIOR	Com- bined Traits ¹	Correlation			
		Separate Traits			
		Mother Favors	Mother Babies	Mother Over-Sol.	Child Center of Home
Signs of positive relationship in one or more groupings					
Shrinks from notice	.38	.32	.19	.02	-.01
Wastes time at routine	.36	.42	.05	.16	-.15
Has nervous habits	.33	.38	.20	.14	-.02
Is jealous	.32	.22	.24	.28	.13
Is tense at rest	.30	.32	.13	.03	-.07
Refuses to share	.30	.24	.32	.25	.05
Asks unnecessary help	.30	.38	.20	.02	.12
Cries easily	.29	.41	.32	.15	.22
Avoids play with others	.29	.22	.50	.37	.22
Avoids risk	.28	.36	.18	.17	.42
Stays close to adult	.28	.19	.40	.25	.30
Tells fanciful stories as real	.24	.22	.00	.04	.00
Attacks others	.24	.19	.26	.38	-.02
Leaves tasks incomplete	.20	.26	.11	.02	-.05
Grumbles	.20	.26	-.02	.19	.16
Dawdles	.16	.25	.08	.19	.30
Resists at rest	.16	.45	.02	.12	.05
Rushes into danger	.16	.20	.16	.02	-.03
Looks for praise	.15	.15	.13	.02	.25
Refuses food	.12	.18	.00	.16	.19
Hard to reason with	.08	.10	.16	.21	-.02
Has temper outbursts	.05	.21	.13	.33	-.05
Sucks thumb	.05	.20	.05	.14	.25
Sulks	.03	.20	-.02	.11	-.10
Has fears	.03	.18	.20	.10	.12
Seeks attention by showing off	.00	.13	.23	.08	.01
Signs of negative relationship in one or more groupings					
Takes property of others	.11	-.19	-.39	.07	-.29
Mistreats animals	-.15	.00	-.12	-.14	-.39
Breaks objects	.00	-.07	.13	-.04	-.27
Misrepresents facts	.06	-.09	-.16	-.16	-.17
Bosses other children	.14	.01	-.21	.03	-.10
Behavior showing no definite relationships					
Refuses to comply	.00	.10	-.02	.12	-.05
Ignores requests	.11½	.17	.12	.04	-.16
Grabs toys	.00	-.05	.04	.05	-.14
Criticizes Others	.00	-.02	-.14	-.10	.11
Number of cases on which correlations are based					
Range	234	145	142	158	221
		to	to	to	to
		183	187	168	235
Median	234	181	152	168	235

¹ Only the three maternal characteristics (parent favors, parent babies, parent over-solicitous) are included in this composite grouping.

HATTWICK: BEHAVIOR
TABLE II

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Relation of Preschool Behavior to Irresponsibility and Negligence
(Data Based on Mothers' Characteristics Only)

Children's Behavior	Correlations	
	Mother Irre- sponsible	Mother Negli- gent
Tendency toward positive relationship		
Misrepresents facts	.36	.35
Has temper outbursts	.36	.16
Seeks attention by showing off	.34	.23
Mistreats animals	.33	.14
Grumbles	.31	.12
Takes property of others secretly	.30	.14
Breaks objects	.26	.25
Sucks thumb	.24	.28
Seeks praise	.23	-.03
Asks unnecessary help	.23	.17
Leaves tasks incomplete	.23	.08
Attacks others	.23	.07
Relates fanciful stories as real	.22	.02
Has nervous habits	.22	.20
Hard to reason with	.22	.07
Ignores requests	.21	.08
Cries easily	.20	.16
Refuses to share	.20	.01
Tendency toward negative relationship		
Dawdles	-.26	-.18
Tense at rest	-.09	-.22
No definite relationships		
Sulks	.18	.16
Grabs toys	.18	.08
Has fears	.17	.01
Jealous	.12	.03
Refuses to comply	.12	.07
Avoids play with others	.11	.03
Criticizes others	.07	-.05
Rushes into danger	.06	.00
Avoids risk	.04	.02
Shrinks from notice	.02	-.01
Refuses food	.02	-.02
Wastes time at routines	.02	-.01
Stays close to adult	.00	.01
Resists at rest	-.03	-.07
Bosses others	-.06	-.10
Number of cases on which correlations are based		
Range	207- 233	220- 241
Median	230	240

The writer has grouped the results in the following discussion so as to provide a generalized picture of the data.

As might be expected, there are marked differences in the degree of relationship found between each of the measures of over-attentiveness and each type of behavior. What is more significant, however, is the fact that general tendencies are quite consistent.

The total picture presented by Table I is essentially that of a group of children with many infantile reactions. They tend to waste time at routines, ask unnecessary help, cry easily, leave tasks incomplete, dawdle, resist at rest, be hard to reason with, have temper outbursts and suck their thumbs.

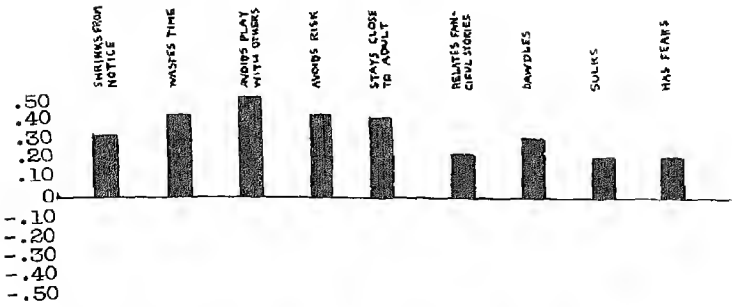
The table also reveals a preponderance of withdrawing as contrasted with aggressive reactions. These children tend to shrink from notice, waste time, avoid play with others, avoid risk, stay near adults, tell fanciful stories, dawdle, sulk, show fears. They show few aggressive tendencies such as attacking others, bossing, refusing to share, refusing to comply, rushing into danger, breaking objects, taking property, etc. There are as many negative as positive relationships between over-attentiveness and this latter group of traits. These contrasts between withdrawing and aggressive tendencies are pictured graphically in Figures 1 and 2.

✓ The positive correlations between the over-attentive measurements and asking help unnecessarily, staying near adults and seeking praise indicate that children who receive too much attention at home are dependent on adults. The positive correlations with avoiding play with others, refusing to share and attacking others also indicate that these children are poorly adjusted in relation to other children. ✓

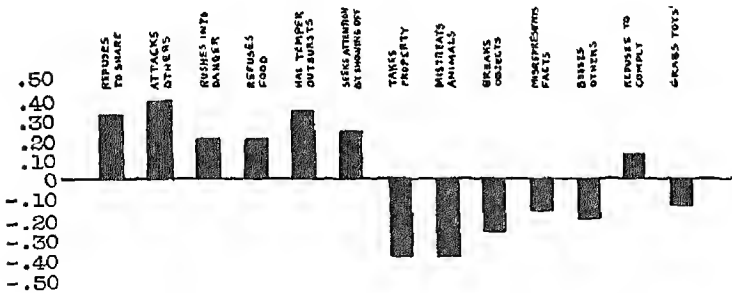
Not only are children who receive too much attention at home poorly adjusted in social relationships but they also seem to lack emotional control. There are positive correlations between the various measures of over-attentiveness and crying easily, nervous habits, jealousy, tenseness at rest, temper outbursts, sulking, grumbling and fears. ✓

The few tendencies toward negative correlations which were found between behavior and over-attentiveness are in keeping with the tendencies discussed above. Misrepresenting facts, breaking objects, bossing other children, taking property and mistreating animals are all aggressive traits. Hence we should expect negative or negligible correlations here rather than positive relationships.

~ One other type of behavior (negativism) remains to be discussed in relation to over-attentiveness. The tendencies toward positive relationships between the measures of over-attentiveness and hard to reason with, resisting at rest and refusing food indicate that negativism is a factor in some cases. The lack of definite relations between over-attentiveness and refusing to comply and ignoring requests suggests that there is not so marked or consistent a relation here as there is in some of the other types of reactions. There are two possible explanations for this in the home: (1) the over-attentive parent is liable to let the child have his own way and hence to permit few opportunities for actual refusal to arise; and



I. Withdrawing Behavior



II. Aggressive Behavior

Figures I and II: Relations Found Between Withdrawing and Aggressive Behavior and Certain Measures of Over-Attentiveness in the Home. (On this chart the largest correlation obtained between the given behavior and any one of the four measures of over-attentiveness has been plotted).

(2) if the child is dependent on adults, he will naturally be more compliant in routine matters, and hence show less of the resistance which is apt to come when children want to help themselves. The carry-over of these explanations to the school situation, however, (where the behavior ratings were made) seems doubtful.

II. THE IRRESPONSIBLE OR NEGLIGENT MOTHER

Only two traits were included on the home data sheet which would seem to indicate the reverse of over-attentiveness. As the definitions show, these two traits are not identical:

Parent Irresponsible: "Parent may mean well but can't be depended upon. Is inconsistent in handling the child or household affairs."

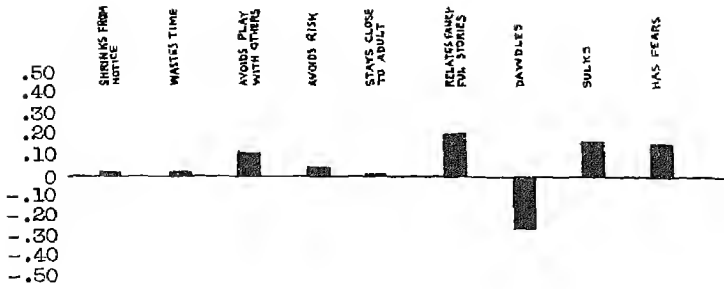
Parent Negligent: "Parent doesn't give the child enough attention."
"Fails to take proper care of child."

The term 'negligent' seems to convey a clear-cut picture of neglect. The term 'irresponsible' seems to convey more of a picture of inconsistency. Both terms agree in indicating some lack of attention. This agreement is apparently greater in the minds of the teachers than the definitions would indicate since the tetrachoric correlation between the two (based on 219 cases) was .86. This correlation makes it interesting to seek similar trends as was done in the preceding section.

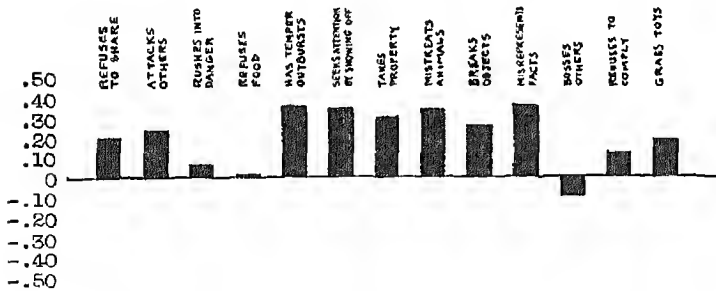
The number of mothers who were rated as being "usually irresponsible" or "usually negligent" were so few in number that the two classifications used in making these comparisons were necessarily expanded to "never", and "sometimes or usually". While this makes the distributions and possibly the size of the coefficients somewhat different from those of other sections of the report, it should not affect any comparisons made between sections on the basis of trends. The rather different definitions received for "irresponsible" and "negligent" made it seem best not to seek a composite set of coefficients for these data.

Table II contains the correlations obtained between the two traits "irresponsible" and "negligent" and pre-school behavior. This table also gives a rather suggestive picture, and one quite different from that presented by Table I.

✓The child whose mother is irresponsible, according to Table II, shows tendencies to "seek attention by showing off," "seek praise," "ask for unnecessary help," "tell fanciful stories as real," "suck his thumb," "have nervous habits," "grumble," "cry easily," "have temper outbursts." This group of behavior traits represents many reactions which are typical of children who are seeking to gain the attention and security which they lack. It therefore suggests that irresponsibility on the part of the mother is tied up with emotional tensions and insecurity on the part of the child. These types of behavior are not all so definitely related to negligence as to irresponsibility, though the positive correlations with "seeks attention by showing off," "sucks thumb," and "nervous habits" suggests that insecurity is also present here. The small number of clear cut relations in the case of negligence might be due in some measure to the fact that



III. Withdrawing Behavior



IV. Aggressive Behavior

Figures III and IV: Relations Found Between Withdrawing and Aggressive Behavior and Certain Measures of Inadequate Attention in the Home. (On this chart the largest correlation obtained between the given behavior and either measure of inattentiveness has been plotted).

such behavior as bidding for attention has more chances of being successful in the case of irresponsible than in the case of negligent mothers.

A comparison of tables one and two indicates that several types of behavior, including some mentioned above, as "asks for unnecessary help," "sucks thumb," were positively related to both over-attentiveness and in-attentiveness. If we continue to examine the tables, we find that these types of behavior occurred in different settings in the two instances. "Asking for unnecessary help," for instance, was, in the case of children with over-attentive parents, associated with other infantile behavior which indicated a lack of opportunities to "grow up" and hence a real inability to help themselves. In the case of children from homes which reflected inadequate attention, this same behavior was associated with reactions (as "bids for attention" and "jealousy") which are indicative of poor emotional adjustment. Here "asks for unnecessary help" seemed not to be motivated by the actual need for physical assistance, but served rather as an attention-getting device.

Further examples of the above points are found in "sucks thumb" and "cries easily," which yielded positive correlations in both tables. The clusterings in which they occur in the two settings suggest that in the case of over-attentive parents, both types of behavior are indicative of infantile habits, while in the case of in-attentive parents they are indicative of deeper emotional tensions. Actual case studies of individual children give further evidence that the above discussion is sound.

Table II definitely reveals more aggressive than withdrawing tendencies. There are positive relationships between negligence and irresponsibility and "misrepresenting facts," "mistreating animals," "taking property of others," "breaking objects," "attacking others" and "refusing to share." There is only one marked correlation between irresponsibility or negligence and any of the behavior of a withdrawing nature. That correlation is a negative one. It indicates that the child whose mother is in-attentive in the above two ways is less liable to dawdle than are other children.

The relationships mentioned above are indicated in Figures 3 and 4. The comparison of these charts with those in Figures 1 and 2 presents an interesting and striking contrast. Just as withdrawing behavior characterizes the child from the over-attentive home so aggressive behavior tends to characterize the child from the inattentive setting.

The positive relation between irresponsibility or negligence and such behavior as "misrepresenting facts," "secretly takes property of others," and "mistreats animals" deserves special mention. These are types of behavior which at a later age are commonly associated with Juvenile Delinquency. Many studies - (2), (6), (8) - have indicated that these types of behavior in Juvenile Delinquents are closely associated with broken and negligent homes. It is illuminating to find that the same relationships are already apparent at the nursery school age.

The definitions indicated that the irresponsible mother is liable to be inconsistent. This fact is interesting when we note in Table II that the child with

TABLE III

Relation of Preschool Behavior to Certain Factors
Indicative of Tensions and of Security in the Home

Children's Behavior	Mother Quarrel- some	Mother Impatient	Mother Nervous	Mother Ill	Mother Fatigued	Mother Happy	Home Calm
Correlations Revealing a Rather Consistent Pattern							
Grabs toys	.65	.32	.38	.31	.26	.03	-.34
Jealous	.63	.37	.16	.16	.05	-.36	-.26
Refuses to share	.46	.24	.38	.05	.05	-.51	-.17
Rushes into danger	.45	.26	.26	.10	-.05	-.16	-.35
Cries easily	.42	.46	.20	.28	.12	-.16	.13
Has fears	.42	.42	.21	.35	.05	-.30	.04
Refuses to comply	.37	.20	-.01	.22	.21	-.27	-.20
Grumbles	.32	.36	.17	.07	.16	-.07	-.28
Has nervous habits	.31	.36	.46	.50	.43	-.35	-.35
Refuses food	.30	.29	.24	.02	-.09	-.21	-.24
Wastes time	.30	.24	.45	.20	.12	-.10	-.03
Avoids risk	.27	.39	.23	.10	.03	-.07	-.04
Hard to reason with	.26	.05	.04	.17	.29	-.38	-.29
Tense at rest	.24	.24	.25	.22	.04	-.59	-.02
Ignores requests	.20	.28	.29	.29	.24	-.25	-.28
Resists at rest	.20	.34	.29	.25	.35	-.39	-.09
Relates fanciful stories as real	.14	.28	.54	.23	.24	-.16	-.06
Leaves tasks incomplete	.12	.24	.27	.34	.27	.06	-.07
Shrinks from notice	.04	.31	-.05	.04	.21	-.25	-.04
Sulks	.01	-.18	.04	.28	.35	-.44	-.22
Correlations Revealing Negligible or Isolated Relationships							
Criticizes others	.40	.05	-.09	-.05	-.34	-.05	-.05
Attacks others	.37	.17	-.16	-.25	.09	-.36	-.16
Looks for praise	.29	-.13	.14	.20	.22	-.13	-.21
Seeks attention	.23	.14	.03	-.02	.19	-.24	-.23
Bosses others	.22	-.25	-.12	-.29	-.38	.16	.10
Has temper outbursts	.15	-.10	.20	.18	.17	-.16	-.16
Stays close to adult	.10	-.11	-.03	-.20	-.25	.20	.15
Asks unnecessary help	.00	.16	.17	.25	-.14	.00	-.09
Sucks thumb	-.03	-.12	.22	-.05	-.03	.05	-.13
Dawdles	-.08	-.15	.37	.37	.04	-.09	.12
Avoids play with others	-.11	-.34	.11	.17	.13	-.26	-.10
Number of Cases on which Correlations are Based							
Range	91 to 110	125 to 137	161 to 178	148 to 169	132 to 143	169 to 187	175 to 184
Median	110	137	178	169	143	187	184

the irresponsible mother tends to ignore requests and to be hard to reason with. Inconsistency on the part of the parent is the trait we should expect to lie behind such behavior.

III. The Calm, Happy Home Contracted with Homes Which Display Signs of Tension

Two traits which seemed indicative of good home adjustment yielded enough material for statistical treatment: "Parent usually happy" and "home usually calm and secure." A tetrachoric correlation of .70 was obtained between the two.

Five traits were used as indications of possible tensions in the home: "mother fatigued," "mother ill," "mother nervous," "mother impatient," and "mother quarrelsome." The inter-correlations between these traits follow:

	Mother Fatigued	Mother Ill	Mother Nervous	Mother Impatient	Mother Quarrelsome
Mother fatigued	--	.78	.56	.34	.24
Mother ill	.78	--	.86	.73	.86
Mother nervous	.56	.86	--	.93	.93
Mother impatient	.34	.73	.93	--	
Mother quarrelsome	.24	.86	.93		--

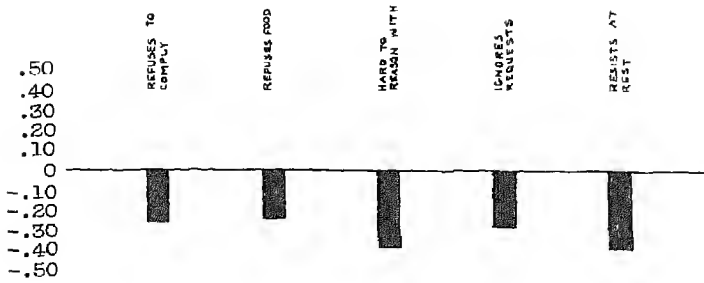
It will be seen, on the basis of the ratings, that "mother fatigued," "mother ill" and "mother nervous" belong to the same constellation much more than do the other traits. "Mother ill" and "mother nervous" bear the most consistently high relationships to the other traits and in this sense might be considered the best single indices in the group. Sufficient instances of positive occurrence were not available to justify a correlation between "mother quarrelsome" and "mother impatient."

Definitions for the traits discussed above are not presented in this section since the terms seem sufficiently clear as they stand.

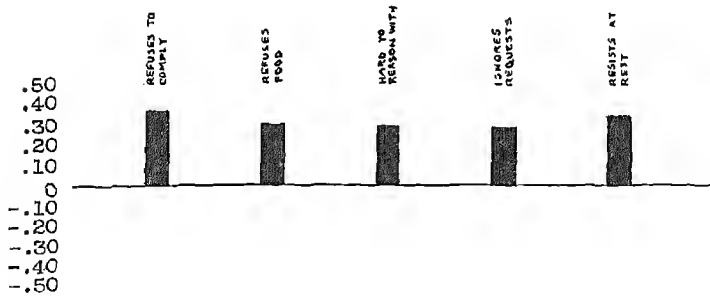
Table III contains the correlations found between the above seven traits and the children's pre-school behavior.¹ The order used in this table is based upon the size of the correlations between children's behavior and "mother quarrelsome." This latter set of data seemed to give the best picture of trends despite the inter-correlations discussed above for "mother ill" and "mother nervous." A set of correlations was obtained between children's behavior and a composite grouping of all signs of tension used in the study but these data added little to the picture already given and are consequently not presented.

The table reveals some very consistent trends in regard to negativistic reac-

¹ Four types of behavior which are included in the preceding tables (child "misrepresents facts," "breaks objects," "mistreats animals" and "secretly takes property of others") are omitted from Table III because the frequency distributions in the tetrachoric charts did not justify the analysis.



V. Co-operative Behavior in Relation to Well Adjusted Home



VI. Co-operative Behavior in Relation to Measures of Tension in the Home

Figures V and VI: Relations Found Between Co-operative Behavior and Measures of Home Adjustment. (On this chart the largest correlation obtained between the given behavior and any of the measures of good and poor home adjustment has been plotted).

tions. Children from homes which are happy and calm were less negativistic than children from the opposite type of homes. This is evident in the negative correlation between "mother happy" and "home calm" and (1) "child refuses to comply," (2) "child refuses food," (3) "child is hard to reason with," (4) "child ignores requests" and (5) "child resists at rest." In contrast, children from homes in which there are signs of tension (fatigue, illness, nervousness, impatience or quarrelling) showed definitely more negativistic reactions---in all of the five behavior patterns listed above---than did the other children. (Figures 5 and 6).

The same type of pattern noted above holds in the case of emotional disturbances. When homes were happy or calm there was less jealousy, fear, grumbling, nervousness and sulking on the part of the child. When homes showed any of the five signs of tension there was definitely more jealousy, fear, grumbling, nervousness and sulking and also more crying and more tenseness at rest. (Figures 7 and 8).

In the present set of data home tensions were not only related to uncooperative behavior and to emotional upsets, but also to personality difficulties, both of the aggressive ("rushes into danger" and "grabs toys") and withdrawing ("shrinks from notice," "avoids rest," "wastes time," "leaves tasks incomplete" and "tells fanciful stories") types. There is not the clear-cut pattern between aggressiveness and withdrawing reactions which the preceding analyses have yielded.

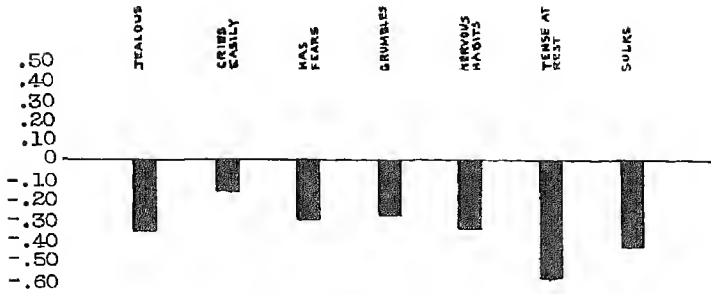
Table III contains a few isolated relationships which deserve mention. The apparent tendency for children to associate more with the adult in the well adjusted than the poorly adjusted home (indicated by positive correlations between "stays near adult" and "mother happy" and by negative correlations between "stays near adult" and "mother fatigued," "mother ill") is not surprising. It is interesting to note that children from calm, happy homes did not demand extra attention as did those whose mothers were quarrelsome and, to some extent, whose mothers were fatigued or ill. Here again it would seem that children from quarrelsome homes lacked a certain security which children from better adjusted homes possessed.

Children whose mothers were quarrelsome also showed considerable bossing, criticism of others and attacking. This behavior might be explained in terms of imitation. It is particularly outstanding since most of the other relationships between such behavior and home tensions were negative in nature.

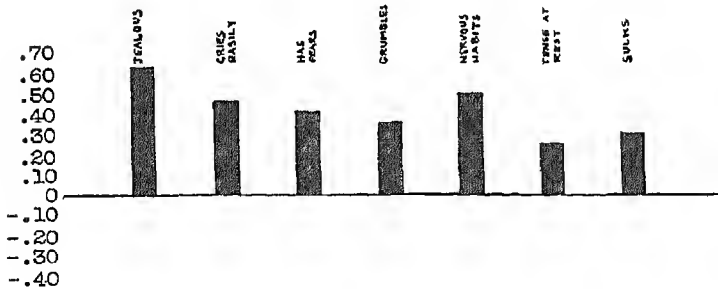
In the table also dawdling is related only to "mother nervous" and "mother ill." This is again a situation where imitation might play a part. "Asking help," with its positive relation to "mother ill," also conceivably fits into this picture.

IV. SHARING RESPONSIBILITIES AND PLAY INTERESTS IN THE HOME

For each home investigated in the study a judgment was obtained as to whether the child had a share in the family activities either in assisting parents, in having certain daily tasks of his own such as setting the table, or in taking



VII. Emotional Behavior in Relation
to Well Adjusted Home



VIII. Emotional Behavior in Relation to Measures
of Tension in the Home

Figures VII and VIII: Relations Found Between Emotional Behavior and Measures of Home Adjustment. (On this chart the largest correlation obtained between the given behavior and any of the measures of good and poor home adjustment has been plotted).

part in other family duties. Judgments were also obtained as to whether either or both parents shared in the child's play experiences such as reading to him, playing games with him, singing with him. As in the previous sections only the definite judgments of "never" or "usually" were used in the statistical comparisons. In this section, however, the groupings were based upon relations with either or both parents rather than upon relations with the mother alone.

The analysis has yielded some very similar and a few strikingly different correlations between preschool behavior and these two types of parent-child relationship.

Relations Common To Both

When parents and children shared either work or play experiences there was a tendency for children to have a better understanding of property rights and values. (Table IV). This is borne out in the negative correlations of the two types of parent-child relationship with "breaks objects," "grabs toys," "refuses to share," "secretly takes the property of others."

There was also a tendency for children who shared either work or play experiences with their parents to have better work habits. This is evidenced in the negative correlations between the two types of parent relationship and "leaves work incomplete" and wastes time at routines."

According to this table, children who shared either work or play with parents were also more cooperative than children who did not have such common experiences. (See the negative correlations between the two types of parent contact and "refuses to comply," "ignores requests.") This cooperative tendency is more marked when children and parents share play experiences than when they share home responsibilities. Negative correlations with "resists at rest" and "hard to reason with" were found only with the former.

Children who shared either work or play experiences with parents also seemed to have better relations with other children. They did not tend to avoid play with others or attack others. Again the relation seems more marked for "child shares play experiences" than for the other grouping (See the correlation with "bosses others" in this connection.)

Other types of behavior which show negative relations to both "child shares home responsibilities" and "child shares play experiences" and which are not discussed elsewhere in this section are "misrepresents facts" and "rushes into danger." No further generalization seems cogent here unless these types of behavior be considered signs of faulty perspective in which case children who share either work or play experiences with their parents could be said to maintain a better perspective or balance in their general reactions.

Relations Found Principally For "Child Shares Home Responsibilities".

When children shared home responsibilities they did not tend to suck their thumbs, grumble, have temper outbursts, ask help unnecessarily, refuse food, dawdle,

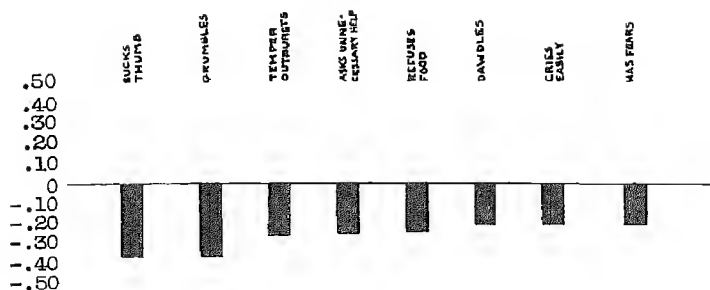
TABLE IV

Relation of Preschool Behavior to (a) Sharing Home Responsibilities
and (b) Sharing Play Experiences with Parents¹

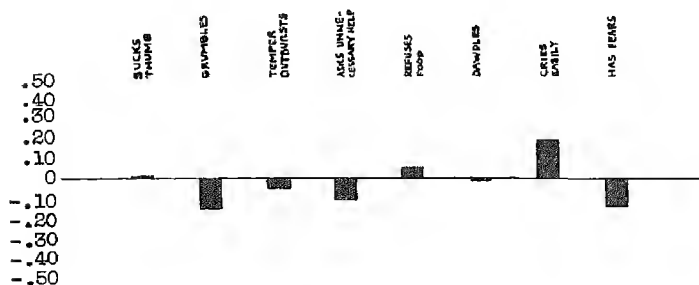
BEHAVIOR	Correlations	
	Child Shares Home Responsibilities	Child Shares Play Experiences
Relationships Common to Both		
Breaks objects	-.58	-.54
Grabs toys	-.55	-.50
Refuses to share	-.40	-.30
Has nervous habits	-.35	-.42
Takes property of others secretly	-.33	-.64
Sulks	-.33	-.27
Leaves work incomplete	-.31	-.32
Misrepresents facts	-.29	-.45
Rushes into danger	-.28	-.41
Ignores requests	-.24	-.31
Avoids play with others	-.24	-.25
Refuses to comply	-.23	-.29
Attacks others	-.20	-.28
Wastes time at routines	-.20	-.24
Relations Found Only For Child Shares Responsibilities		
Sucks thumb	-.37	.01
Grumbles	-.37	-.15
Has temper outbursts	-.26	-.05
Asks unnecessary help	-.25	-.12
Refuses food	-.24	.05
Dawdles	-.21	-.02
Cries easily	-.21	.18
Fears	-.21	-.14
Relations Found Only For Child Shares Play Experiences		
Shrinks from notice	-.17	-.45
Seeks attention by showing off	-.19	-.34
Looks for praise	.14	-.30
Bosses others	.18	-.30
Resists at rest	-.06	-.28
Hard to reason with	-.17	-.24
Avoids risk	-.08	-.23
Jealous	-.08	-.20
Tense at rest	-.04	-.20
Number of Cases on which Correlations are Based		
Range	193-	206
	206	217
Median	205	217

¹ Relationships with either or both parents are included in this category. No definite relations were found with: Goes to adult with criticism of others; Stays close to adult; Relates fanciful stories as real. Mistreats animals gave too one-sided a distribution to justify correlations.

HATTWICK: BEHAVIOR

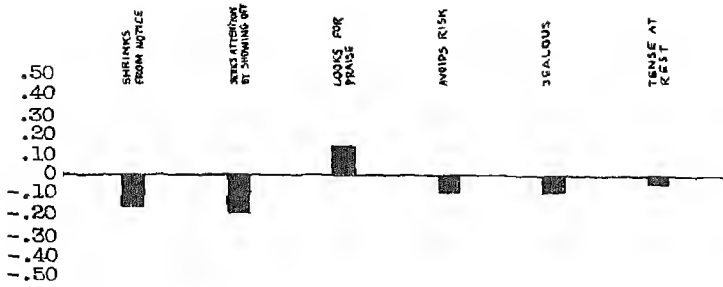


IX. Infantile Behavior in Relation to Sharing Home Responsibilities

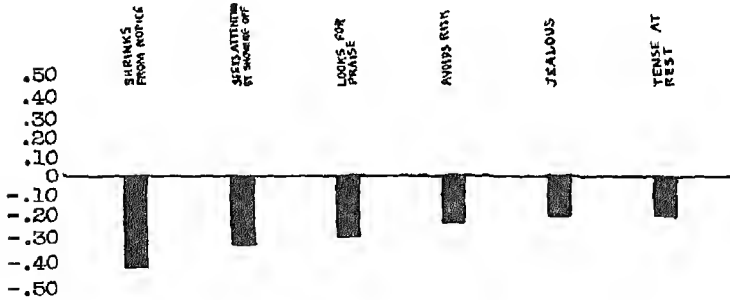


X. Infantile Behavior in Relation to Sharing Play Interests with Parents

Figures IX and X: Relations Found Between Infantile Behavior and Child's Sharing of Home Responsibilities and of Play Interests with Parents.



XI. Emotional Adjustments in Relation to Sharing Home Responsibilities



XII. Emotional Adjustments in Relation to Sharing Play Interests with Parents

Figures XI and XII: Relations Found Between Emotional Adjustments and Child's Sharing of Home Responsibilities and of Play Interests with Parents.

cry easily or have fears. It would seem from these relationships that sharing home responsibilities tends to help the child overcome infantile reactions and to make him more self-reliant. None of these relationships were found in cases where children shared play interests with their parents (Figures 9 and 10).

Relations Found Principally For "Child Shares Play Experiences".

Certain relationships were found between behavior and sharing play experiences which were not found between behavior and sharing home responsibilities. (Figures 11 and 12.) Children who shared play interests with their parents did not shrink from notice, seek attention by showing off, look for praise, avoid risk, show jealousy, show tenseness at rest. Three of these traits in particular ("seeks attention by showing off," "looks for praise," "jealous") are suggestive of emotional insecurity.

Not all behavior characteristic of emotional insecurity is limited in its relationships to this particular grouping. For example "has nervous habits" and "sulks" were found to be related to both classifications. However, in general, it would appear that the sharing of play experiences helps the child gain a feeling of security just as sharing home responsibilities seems to help him develop better habits of self-reliance and control.

The relationships found between "child shares play experiences with parents" and such behavior as "bosses others," "resists at rest" and "hard to reason with" have been discussed above and need no further discussion here.

GENERAL SUMMARY AND COMMENTS

This preliminary investigation has yielded some consistent and suggestive relationships between certain types of factors in the home and certain types of behavior in early childhood.

The study has suggested that children whose homes reflect over-attentiveness are liable to display infantile, withdrawing types of reaction. This finding is in substantial agreement with other evidence available in the field. Fitzsimmons (3), for instance, in her study of children of over-protective and rejective parents, also discovered the relationships indicated above. Adler gives one picture of the only child (11), the child who is pampered and babied, which is very similar to the picture given in Table I. A recent study by Stowell and the author (5) on over-attentiveness of parents in relation to work habits and social adjustments of children during the first six grades of school, also substantiates, to a surprising degree, the findings given above.

Previous studies also substantiate the present findings of positive relationships found between inadequate attention in the home and aggressive types of behavior. Mention has already been made of studies on Juvenile Delinquents (2, 6, 8) in which such behavior as misrepresenting facts, secretly taking property of others, mistreating animals, etc., seems to be closely associated with broken and otherwise negligent homes. Fitzsimmons's study (3) suggested that children whose parents are negligent are liable to show behavior difficulties of the aggressive

sort.

The study has given consistent evidence of the value of a calm, happy home in securing cooperative behavior and good emotional adjustments on the part of the child. Homes which reflected signs of tension in the form of frequent illness, fatigue, impatience, quarrelsomeness or nervousness made for uncooperative behavior and poor emotional adjustments.

The study has also revealed some useful techniques for furthering the child's development and for improving his adjustments. It has indicated that children can be helped in their development of self-reliance and in their consequent loss of infantile habits by having definite responsibilities in the home. It has also indicated that an opportunity to share play experiences with the parents is of real value in developing feelings of emotional security. A common recommendation in the nursery school, for parents who are faced with the jealousy of one child toward a newly arrived infant, is that the parents give the jealous child a definite time each day (perhaps 10 or 15 minutes) which is all his own. Such a special period which the child knows is his usually suffices to prevent jealousy over the extra attention which the infant necessarily requires during the remainder of the day. This technique is in complete accord with the research finding just reported.

The present investigation has also indicated that the constellation of behavior difficulties occurring in the school is in itself an important clue to the underlying factors. Asking for unnecessary help was, in the case of children with over-attentive parent, associated with staying near the adult and with various infantile reactions. In this case the behavior seems largely the result of lack of experience or of opportunities to "grow up." Asking unnecessary help was, in the case of children from homes which reflected inadequate attention, associated with seeking attention by showing off, seeking praise, and other forms of poor emotional adjustment. In this case the same behavior would not seem to be motivated by the actual need for physical assistance but to serve rather as an attention-getting device.

In closing it should be remembered that the present findings are offered only as suggestions of relationships which frequently, but not invariably occur. It is hoped that other studies which are being conducted along this line will contribute further understanding of these and similar relationships. A factor analysis which is also under way, on the behavior rating of the children used in the present investigation, should throw additional light on the data which have already been presented.

REFERENCES

- 1) Burgess, E. W.: Family and personality development. (Abstract) Iowa State Conference on Child Development and Parent Education, Univ. Iowa Extension Bull., No. 261, 1932.
- 2) Burt, Cyril: The young delinquent. New York, D. Appleton Co., 1925.
- 3) Fitzsimmons, Marion J.: Some parent-child relationships. Teachers Coll. Contrib. to Educ., No. 643, Bureau of Publ., Teachers College, Columbia Univ., New York, 1935, pp.xi, 162.

- (4) Francis, Kenneth V. and Fillmore, Eva A.: The influence of environment upon the personality of children. Univ. Iowa Stud., Stud. Child Welfare, 1934, ix, No. 2, pp. 71.
- (5) Hattwick, Berta Weiss and Stowell, Margaret: The relation of parental over-attentiveness to children's work habits and social adjustments in kindergarten and the first six grades of school. (To appear in forthcoming issue of J. Ed. Research)
- (6) Healy, W. and Bronner, A. F.: The individual delinquent. Boston. Little, Brown & Co., 1915.
- ✓ (7) Ogburn, W. F.: The family and its functions. Ch. xiii, Social Trends. Vol. I, McGraw Hill Book Co., 1933.
- (8) Slawson, John: The delinquent boy. New York. Richard G. Badger Co., 1926.
- (9) Stoddard, George D.: The family as a mediating factor in child adjustment. In report of Fourth Conference on Research in Child Development, Chicago, June 22-24, 1933. Issued by Committee on Child Development, National Research Council, Washington, D. C.
- (10) Ward, Anne: The only child: A study of 100 only children referred to a child guidance clinic. Smith College Studies in Social Work, Northampton, Mass., 1932.
- (11) Wexberg, Erwin: Individual psychology. New York. Cosmopolitan Book Co., 1929, pp.viii, 428. (p. 183)
- (12) White House Conference on Child Health. Section III, Education and Training. Committee on Family and Parent Education. New York, Century Co., 1930, pp. xviii, 354.
- (13) Williams, Herbert D.: Causes of maladjustment in children. Psychol. Monog., 1932, 43, 276-300.

PREFERENCES OF PRESCHOOL CHILDREN FOR SPECIFIC GEOMETRIC FIGURES

FLORENCE JENNINGS¹

Aesthetic theorists have always held that preference for a specific geometric figure is intrinsic to that figure itself. Thus Hogarth (2) in the 18th century, asserted that the key to beauty of visual form in two dimensions lies in the flattened S curve. Zeising (3) maintained that a given figure is beautiful only if the ratio of the separate parts is in the "Golden Section." The most modern exponent of this general principle of mathematical criteria for beauty is Birkhoff (1), who holds that "aesthetic" preference for one form among others is directly dependent on the relative simplicity, equilibrium, and vertical and rotational symmetry of that specific figure. He has devised a scale by means of which he assigns numerical "aesthetic values" to simple figures.

According to Birkhoff's scheme, positive values are assigned for the following points: a. Vertical symmetry; b. Rotational symmetry; c. Equilibrium; and d. Good relation between the vertical and the horizontal.

Penalties are exacted for: a. Too small distances between vertices and sides; b. Angles that are too near 0 or 180 degrees; c. Ambiguities; d. Unsupported re-entrant sides; e. Diversity of niches and directions; f. Lack of symmetry; and g. Complexity.

In order to test Birkhoff's general hypothesis, 30 figures that he had evaluated were cut out of black paper and mounted on white cards $2\frac{1}{2}$ by 3 inches. They were then divided into 3 series of 10 cards each, the cards in the first series ranging in value from 1.5 to -.1; in the second series from 1.25 to -.11; and in the third series from 1.16 to -.17. Each series was then presented to 50 adults, who were asked to arrange the cards in order of preference.

Results from this preliminary survey emphasized the futility of the method. Each card in each series was given ratings from best to worst by some of the subjects. In some series there was more frequent preference for cards of high "aesthetic value" than for others. Reports from the subjects themselves indicated that, although the order of presentation had been uniform, juxtaposition of certain cards influenced final choices. Some subjects arranged the cards spontaneously by no fixed method, others according to elementary rules of what is considered "good" or "bad" art. A few chose by means of associations. Still others admitted they had no preferences but had only arranged the cards in rows to fulfill the requirements of the experiment.

In view of these results, it was decided to take only one of the three series and to test subjects of different age-levels in order to discover the methods by which choices for geometric figures may be made. It was also hoped that some data might be obtained to throw light on the development of adult standards and tastes.

¹ From The Child Institute, The Johns Hopkins University.

This report deals only with some preliminary work carried on with pre-school children. The specific problems of this part of the investigation were as follows:

1. To discover whether children of pre-school age are capable of making a consistent choice on the basis of either:
 - a. A specific geometric figure presented in a series with other figure. Or
 - b. A specific position in the presented series regardless of the specific card occupying that position.
2. To discover whether choice for card is easier in a series with actual pictures than in a series of geometric figures.
3. If either of these methods is found, to discover any possible relationship between method and chronological age.
4. Among those who choose consistently for card, to discover whether preferences are in conformity with adult standards of "aesthetic value."
5. To discover the relation between two methods of grouped choices of children and adults.
6. Among those who choose consistently for position, to discover which position is most consistently preferred.
7. To discover any possible relationship between consistency in making choices and time taken to make a choice.

APPARATUS AND PROCEDURE

The figures used in the experimental series were the same as those used in the first adult series. These cards were arranged in descending order of aesthetic value. Alternate cards were then taken to form the following 2 series of 5 cards each:

SERIES I		SERIES II	
Card	Aesthetic Value	Card	Aesthetic Value
A	1.50	B	1.00
C	.75	D	.58
E	.33	F	.25
G	.21	H	.12
I	.00	J	-.10

As before, the cards were made by cutting the figures out of black construction

paper, taking care to make the areas as nearly equal as was possible. These figures were then mounted on white paper $2\frac{1}{2}$ by 3 inches, and on heavy gray pasteboard $3\frac{1}{4}$ by $3\frac{7}{8}$ inches, so that a margin of seventh-eighth of an inch was left between the lower edges of the white and gray cards.

A picture series, originally used to illustrate the procedure but later retained as a check on the figures, was made by pasting 5 black and white pictures on white and gray cards similar to those used for the 2 experimental series. The cards were as follows:

- Picture 1 -- Two boys holding 8 puppies
- Picture 2 -- A white terrier
- Picture 3 -- A small car
- Picture 4 -- A Boston Bull terrier
- Picture 5 -- A horse and a girl in riding clothes

The apparatus used for presenting the two experimental series consisted of a black wooden box, $19\frac{1}{2}$ inches wide, 6 inches deep and 20 inches tall. The front of the box was enclosed, but a screen could be raised to reveal an 8 inch opening at the lower front. Each of the two series was placed upright in a groove parallel with the back of the box. The first groove, 5 inches from the back, was on a movable frame so that, by means of an outside string, it could instantly be raised above the opening to reveal the second series of cards standing in a stationary groove 4 inches from the back of the box. The movable frame was backed with black cardboard 4 inches high so that removal of a card in the first series, did not instantly reveal one of the second series.

Uniform illumination in the entire box was obtained by inserting a ground glass panel in the top of the box. This diffused the light from two 100 watt lamps built in immediately above the glass. The "mail box" was a silver card board box, $7\frac{3}{4}$ inches wide, $7\frac{3}{4}$ inches deep and $9\frac{3}{4}$ inches tall, with a slot 5 by $\frac{5}{8}$ inches in the lid.

The presentation box was placed on a low table so that the cards would be at approximately the eye level of the child seated before it. The "mail box" was placed on a low stool to the right of the child. The Experimenter sat back of the child and somewhat to the right, so that she could raise the screen and the frame and at the same time make records without attracting too much attention from the child.

The first series was arranged on the movable frame and the second in the stationary groove. The frame was then lowered into position and the screen was closed. The Picture Series was arranged on the outside of the box placed upright against the closed screen. The pictures were then covered with black card board until the child was seated before the apparatus. In order to secure maximum benefit from the controlled lighting effects window shades in the experimental room were closed.

The arrangement of the cards on all three series varied on each of the five trials so that at the end of the experiment each card had occupied each of the

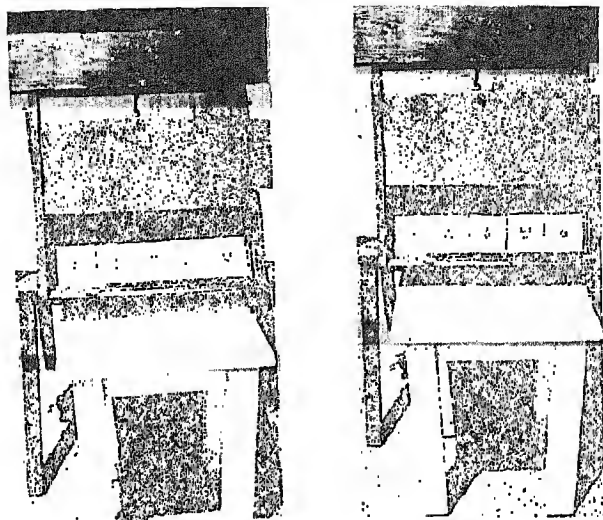


Figure 1. Illustration of figures presented in the two experimental series.

five possible positions. Arrangements, reading from the child's left, were as follows:

TRIAL	PICTURE SERIES	SERIES I	SERIES II
1	1, 2, 3, 4, 5,	A, C, E, G, I	B, D, F, H, J
2	2, 4, 1, 5, 3,	C, G, A, I, E	D, H, B, J, F
3	3, 5, 2, 1, 4,	E, I, C, A, G	F, J, D, B, H
4	4, 3, 5, 2, 1,	G, E, I, C, A	H, F, J, D, B
5	5, 1, 4, 3, 2,	I, A, G, E, C	J, B, H, F, D

When the child had been seated before the box, the screen was removed from the Picture Series and the following instructions were given:

"See these pictures?" (pointing to series) "And see this box?" (pointing to mailbox and outlining slot) "It's like a mail box, isn't it? Take the prettiest picture and mail it in the mail box" (Again pointing to series and then to mail box) "Ready. Take the one you like best."

As soon as the child had mailed a card, the remaining four pictures were re-

moved and the Experimenter said:

"Now see the big black box?" (pointing to apparatus) "It has some more pictures in it. When I open the box take the prettiest picture out and mail it in the mail box. Ready. Take the one you like best."

The screen was then raised until the child had taken a card in his hand. Then the screen was dropped and the movable frame raised so that the second series would be exposed as soon as the box was opened.

"Now I'll open the box again. Take the prettiest picture out and mail it in the mail box. Ready. Take the one you like best,"

The screen was then again raised until a card had been chosen.

Time was taken on the two experimental series with a stop watch. This was recorded from the moment the screen was raised to the time a child touched a card with the obvious intention of mailing it. A child rarely changed his selection. If two cards were touched the first was recorded as the one chosen, while note was made of the other. Since the Picture Series was used to illustrate procedure and was revealed while instructions were being given no record of time was kept. Verbal responses were recorded for all three series. The three series were always presented in one sitting. No child received more than one complete trial a day.

Subjects were 22 children attending the Child Institute at the Johns Hopkins University. Their ages ranged from 31 to 59 months:

Age in Months	Boys	Girls
30-35	1	2
36-41	5	3
42-47	-	2
48-53	4	2
54-59	-	-
60-65	1	-
66-71	<u>1</u>	<u>1</u>
	12	10

RESULTS

1. Individual Consistency.

- a. For cards. Since a total of five trials was given on each series, three choices of the same card was taken as the criterion for a consistent preference due to something other than a chance factor. Ten children met this criterion on the Picture Series, 8 on Experimental Series I and 6 on Experimental Series II.

Some of the children chose the same card four or five times. These results

are summarized in the following table:

<u>Series</u>	Number of consistent choices			Total number consistent
	<u>3</u>	<u>4</u>	<u>5</u>	
Picture Series	3	4	3	10
Series I	5	2	1	8
Series II	3	3	0	6

Three children were consistent on all series; five were consistent on both of the Experimental Series. From both the standpoint of total number of children choosing consistently on each series, and the number of children choosing the same card on more than 3 trials, it seems that these children had slightly more decided preferences for the pictures than for the geometric figures. This difference was not very large.

- b. For position. The same criterion of three choices as a basis of consistent preference was used in analyzing results according to choice for specific position in the series. Seven children chose for position in the Picture Series, and 13 chose for position on each of the two Experimental Series:

<u>Series</u>	Number of consistent choices			Total number of consistent children
	<u>3</u>	<u>4</u>	<u>5</u>	
Picture series	6	0	1	7
Series I	5	6	2	13
Series II	6	3	4	13

Three children chose for position consistently on all three series; twelve chose consistently on the two Experimental Series. There was far less choice for position in the Picture Series than in the two Experimental Series. This holds true both for total number of children choosing consistently for position and for number of children making more than 3 choices.

2. Relation between method used for making choices and chronological age.

- a. Chronological age and choice for card. The average age in months of children making 3, 4, or 5 consistent choices on each of the series was as follows:

<u>Series</u>	Number of consistent choices			Average age of all choosing consistently
	<u>3</u>	<u>4</u>	<u>5</u>	
Picture Series	45.5	-	36.0	44.3
Series I	42.0	39.2	37.0	39.8
Series II	40.5	45.0	39.0	41.1

Choice for position thus occurs more frequently with the figures than with the

pictures. There is a steady decrease in choice for position with increase in chronological age.

3. Group choices for individual cards.

The total number of times each card was chosen and the ranking it attained were as follows:

	Picture Series					Series I					Series II				
Card	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>A</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>H</u>	<u>J</u>
Times chosen	13	32	31	14	20	22	35	12	27	14	18	17	26	28	21
Ranking	5	1	2	4	3	3	1	5	2	4	4	5	2	1	3

These choices seem to bear no significant relation to theoretical standards of "aesthetic value."

The procedure used with 50 adults was different, for all 10 cards were presented in one series and the subjects were asked to rank all cards in order of preference rather than to pick the favorite. Nevertheless, it might be interesting to compare their final rankings with those of the children.

Adult ranking for all 10 cards -- Method of average rank.

Card	<u>A</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>H</u>	<u>J</u>
Rank	5	3	6	1	8	4	10	2	7	8

It seems that both adults and children tend to rate cards G, C and F relatively high.

4. Group Choices for position.

The total number of times cards in each position were chosen and the ranking for each position are summarized below.

	Picture Series					Series I					Series II				
Position	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Times chosen	25	16	20	24	25	15	6	43	23	26	8	20	38	13	36
Ranking	1	5	4	3	1	4	5	1	3	2	5	3	1	4	2

Choice for position is not well shown in the Picture Series. In the other two series, the middle and the extremes in position were definitely preferred.

5. Cards preferred by those who chose consistently.

It is interesting to note that those children who chose consistently for cards tended to agree on the particular card they preferred:

Number of Cards Chosen Consistently.

Picture Series	Card	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Times chosen		0	4	4	0	2
Series I	Card	<u>A</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>
Times chosen		2	4	0	1	1
Series II	Card	<u>B</u>	<u>D</u>	<u>F</u>	<u>H</u>	<u>J</u>
Times chosen		1	2	1	2	0

6. Positions preferred by those who chose consistently for position.

Number Consistent Preferences.

	Position	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Picture Series		2	1	1	1	2
Series I		1	0	7	0	5
Series II		0	1	6	0	6

There was no position that was consistently preferred on the picture series. Marked preference was given to the middle and last positions on both experimental series. Of the 12 children who chose for position on both Series I and II, 10 children chose the same position twice.

7. Relation between method of choice and time.

The average time needed for making a choice among those who chose for pictures was 52.4 seconds on Series I and 37.2 seconds on Series II. Those who chose for position averaged 98.8 seconds on the first series, and 47.7 on the second.

Choice for position therefore, seemed to require a longer time although the difference does not seem to be very reliable. In both cases, more time was required for Series I than for Series II.

SUMMARY AND CONCLUSIONS

Twenty-two nursery school children were shown three sets of five cards. One series consisted of black and white pictures, the other two series of geometric figures cut out of black construction paper. They were asked to pick the card they preferred out of each series. Each set of cards was presented five times, so that by the end of the experiment each of the cards had once occupied all of the five possible positions in the series.

Although subjects were too few to permit generalizations, the following conclusions may be drawn:

Among 22 pre-school children the majority showed themselves capable of choosing cards on a basis better than chance. They chose either on the basis of the cards presented or on the basis of the position a card might occupy in a series.

Pictures were chosen more frequently for card and less frequently for position than were geometric figures.

Ability to choose by card increased steadily with chronological age; choice for position decreased with chronological age.

There was no relation between cards chosen most frequently and theoretical standards of aesthetic value.

As nearly as can be determined by the use of different procedures adults and children tend to prefer the same geometric forms.

Children who choose according to specific cards tend to agree on the cards they prefer.

Children who choose according to position tend to prefer the middle and the last positions.

Children who choose for card on one experimental series tend to do so on the other. The same holds true for choice of position. In the latter case they also tend to choose the same position on both series.

Choice for position seems to require a longer time than choice for card. Overlapping of time is so great, however, that the difference does not seem to be reliable.

REFERENCES

- (1) Birkhoff, G.: Aesthetic measure. Cambridge, Harvard Univ. Press, 1933, Chapter 1.
- (2) Hogarth, W.: The analysis of beauty. A reprint. (The Silver Lotus Shop, Pittsfield, Mass. 1909). (First published 1753).
- (3) Zeising, A. Neue Lehre von den Proportionen des Menschlichen Koerpers. (R. Weigel, Leipzig, 1854).

THE METHOD OF ADMINISTRATION OF THE RORSCHACH INK-BLOT TEST

MARGUERITE R. HERTZ ¹

Various claims have been made for the Rorschach Ink-blot Test in the fields of psychology and psychiatry. For a review of the work done with the Rorschach method up to January, 1934, reference should be made to Vernon (31, 34) or to Hertz (7). The method is valuable for the diagnosis of intelligence, types of intelligence, aptitudes and talents, and vocational fitness. Personality studies may be made of different groups of children and adults. Racial differences may be detected, the influence of heredity and environment on personality disclosed. The test is effective as a clinical diagnostic instrument. Characteristic differences in terms of the Rorschach factors may be established among various personality and behavior types. The different mental disorders may likewise be diagnosed. Finally, the test may serve as a valuable supplementary technique to the psychoanalytic method.

Despite this extensive work, however, the test suffers from serious limitations. As has already been pointed out (7), the administration of the test has not been standardized. The scoring is highly subjective and indefinite. Norms are still inadequate for different age-groups and those which have been published have been amassed by different methods of administering the test and by the employment of a variety of criteria and of scoring methods.

It is obvious that the reliability and the validity of the test depend in part upon the standardization of the method of administration. Gross variations may appear in two Rorschach psychograms of the same individual, depending upon variations in the manner of giving and of scoring the test. The objectivity of the scoring itself depends in a measure upon adequate standardization of the administration. Variations in instructions, in the manner of presenting the blots, in the accompanying conversation and suggestions, in the attitude of the examiner, in the approach of the subject, and in the length of time allotted, -- all affect the reliability of the scores and the resultant psychogram.

An examination of the work which has been done with the Rorschach method shows that the test has not been standardized to the point where all examiners apply the method in the same way. Unfortunately no guide or manual has yet been produced. The original Rorschach publication (27) has been re-edited (29) but is still inadequate to give the student satisfactory comprehension of either the technique of administration or the proper evaluation of the test factors. Reference should be made to the articles by Beck (1-3), Vernon (31), Loosli-Usteri (15), Löpfle (17), Oeser (24), Kerr (11), Honniger (22) and Guirdham (5), for descriptions of the administration and scoring in more or less detail.

Many investigators believe that the test is easy to administer. Mac Calman (18), for example, says in reporting on the test, "The administration of the test is simple in the extreme". Practice with the method, however, impresses one with

¹ From the Brush Foundation, Western Reserve University.

the innumerable difficulties involved in recording the responses accurately and in locating the details or combination of details which have been selected for interpretation.

Most examiners try to administer the test in accordance with the directions set forth in the manual (27, 29) and in the subsequent article which was published by Oberholzer after the death of Rorschach (28, 29). While the procedure is generally outlined and many suggestions and examples are included in order to guide the examiner, there is still much variability in the way the test is given by different administrators.

Some examiners sit opposite the subject, others beside him. Vernon (31) places the subject in front of him a little to the side so that he may have the view of the card as it is being examined by the subject. Beck (3) makes sure there is no table or other furniture before the subject, thus precluding setting the card down.

Most examiners like Beck (1-3), Loosli-Usteri (15), and Mandoweky (19) use Rorschach's instructions "What could this be?" or "What do you see?". Others like Juarros and Soriano (10) and Vernon (31) change the instructions slightly, thus: "Will you tell me if this suggests anything to you?". Salas (30) asks his subjects what they see or what they think the pictures represent. Line and Griffin (14) simply ask what the picture might be, what it suggests, adhering to what they call "the standard procedure". Powell (26) says "Tell me everything you see in this."

Oeser (24) gives more elaborate instructions: "You will be given a number of blots to interpret in any way you choose and in your own time. The blots don't mean anything in themselves but it is possible to see almost anything in them, just as you can see faces and figures in the fire or in clouds. I am going to note the average time, so don't uncover a blot until I say 'now'". The subject is then given the cards and told he can take as long as he likes and say what he likes. The wisdom of suggesting a particular kind of response even if only given as an example to explain the nature of the test, is to be questioned. It would seem that such suggestive words as "fire", "clouds" and "faces" might set up definite trains of thought and might serve as a control throughout the test. As a matter of fact, Rorschach (29) has shown how control of this nature when deliberately initiated, influences the scores, eliciting pictures different in many respects from those which are obtained when no suggestions are made.

Some examiners modify their instructions to suit the particular age-group in which they are interested. Kerr (11) adapts the instructions used by Oeser, thus: "Someone has made some blots of ink on these cards. I want you to tell me what you think they look like. You know the way people sometimes see faces in the fire, well I want you to tell me what you see in these blots." The same criticism may be applied to these instructions as to those of Oeser. Beck (3) specifically cautions against saying anything which in any way suggests a certain kind of response.

Cards are generally presented by the examiners, one at a time, the correct

side uppermost, some examiners handing the cards to the subjects, others permitting the subjects to help themselves. Rorschach is generally followed in the instruction to the subject to hold each card at any distance "within arm's length", but not from a greater distance. Rorschach also indicates that the subject may turn the card at will, looking at it from different sides, upright, upside down, or sideways. Some examiners tell their subjects to turn the card, reminding them when they fail to do so. Others suggest to the subject that "he may see more objects in the card if he turns it". Still others are silent on the matter of viewing the card from different angles, leaving it to the subject to do as he will. Mac Calman (18) instructs, "If the patient asks, - and only if he asks - he can be told that the card may be turned at will".

Similarly, the matter of speed of associations and that of number of responses are treated in different ways by different examiners. Some encourage the subject to "give at least one answer each way", others "to answer as quickly as possible", others "to give at least one answer each way", and still others reduce their comments to a minimum. Beck (3) encourages the subject to the extent of saying "most people see something" or "most people see more than one thing". Rorschach permitted urging to the point of getting at least one response for each card.

Rorschach found it impractical to limit time of exposure for each blot. He permitted unlimited time. He estimated that for normal subjects, the total time for the entire test should be from twenty to thirty minutes. Many examiners like Beck (1-3) Levy (12), Oeser (24), Vernon (31) and Mandowsky (19) follow Rorschach's procedure in giving unlimited time, generally recording the total time for each card. Oeser's subjects averaged about 45 minutes. None of his subjects took as little as 20 minutes and twenty-four of them took over 30 minutes. Vernon's adult subjects took between 30 minutes and 2½ hours. Harriman (6) reported that his subjects took from 35 minutes to 2½ hours likewise. Some of Powell's subjects (26) took less than 2 minutes per card, others as long as 20 minutes to a card.

Löpre (17) limited his subjects to 7 responses for each blot. Line and Griffin (14), testing healthy adults and mental hospital patients, placed a time limit of 5 minutes per picture on the healthy subjects, no time being imposed on the others. The subjects were not warned of this, however, but were simply handed another card at the expiration of the allotted time. The authors report that only in very few instances was the full 5 minute period utilized. Vernon (31) disproves of all such curtailment although in a subsequent article (32) in discussing this writer's work, he admits that it may be a legitimate procedure "when it is desired to treat the results of normal subjects statistically".

As with other tests, the attitude and the degree of cooperation of the subject are of utmost importance. Some examiners report that normal subjects display great interest in the test and put forth their best efforts as a general rule. Rorschach thought that children especially would find the test pleasant and easy. Some investigators, on the contrary, report difficulty with children. Pfister (25) for example, could not interest many of his low grade adults, many of them merely responding "I don't know". Juarros and Soriano (10) and Mira (20) likewise experienced difficulty with their mentally deficient subjects. On the other hand,

some subjects of Ganz and Loosli-Usteri (4) liked to do the test, taking it as a game. In another article, Loosli-Usteri (16) reports that her children could not appreciate the "meaninglessness" of the blots.

Oeser (24) reports that the symmetrical arrangement of the blots tends to be monotonous and affects certain types of subjects, such as his "color-reactors". Vernon (31) made similar observations.

Most examiners emphasize the importance of noting behavior while the examination is being given. They note attitudes, hesitation, distractions, chance remarks, comments on the test material, criticism of the responses, and the like. All these observations are extremely valuable in interpreting the test scores.

According to Rorschach's instructions, most examiners record everything the subject says, with the location of the details which have been selected for interpretation. Many examiners describe as accurately as they can, the position of the card and the location of the details. Many have adopted Loosli-Usteri's device (15) of the symbol "v" in its different positions (\wedge , \vee , $>$, $<$), the apex always referring to the top of the card to indicate how the subject held the card. Monnier (22) uses the arrow in similar fashion, to indicate the top of the card. Following Rorschach's suggestion, tracing sheets are frequently employed either by the examiner or by the subject himself when it is especially difficult to describe exactly what part of the blot elicits the response. Vernon (31) has recommended the use of prepared mimeographed diagrams on which the responses of the subject may be written in the appropriate places, each response being numbered. Space is then left along the sides or at the bottom for responses to the whole blot.

It is essential, in recording the responses, to get as much information as possible, not only as to what detail or combination of details was selected, but also as to what influenced the response, - form, movement, color, or shading, or a combination of these elements. Rorschach permitted cautious questioning of the subject after the test had been completed. This procedure is followed by most examiners. Becks (3) asks his questions indirectly so that his subjects will not know what elements are involved in the test. Vernon (31) on the other hand, thinks there is no harm in asking the subject directly what influenced his answers. Both caution against questioning the subjects while the test is in progress, thinking they might influence the responses to the later blots by suggesting in the course of the examination the specific factors that are scored.

Finally, most examiners try to keep the test situation as free and easy as possible. They try to avoid all restraint and formality. Conversation is encouraged; all questions are answered. There are some, however, who emphasize a minimum of conversation. Mac Calman (18) for example says "with the average patient, the examiner need say nothing with the exception of the first question, until the test is finished"

From the foregoing resume, it can be concluded that there is much variability in the administration of the Rorschach test. In order to reduce the amount of error and to make the administration as controlled and as objective as possible, the

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test needs some degree of standardization. This involvee 1) control of the conditions of the test so as to keep the reactions of the subject as uniform as possible, 2) the development of standard instructions which will elicit adequate responsee and 3) the working out of a syetem of recording the responsee which will give ecores that will be comparable when the taet has been given to the eame individuals by different examiners.

Problem

Reference has already been made (7, 8, 9) to the research project conducted by the Brush Foundation.¹ As a result of preliminary work² with the test based on a "normal miscellaneous" group of 70 subjects, and "emotionally unstable group" of 30 patients and a "mentally disordered group" of 50 patients, it was deemed necessary to make certain modifications in the administration of the test prior to attacking the problems of reliability and validity. The ensuing report is an account of the procedure of administration as modified and standardized by the Brush Foundation and is the method which is used to date in the Rorschach examination.

Material

The standard series of ink-blot was mounted on stiff cardboard for durability. There was no visible change in their appearance. Additional equipment was prepared consisting of

- Personal Data Sheets
- Record Blanks
- Trial Blots
- Diagrams of the Ink-blot designs
- Tracing sheets
- Summary Sheets
- Stop-watch
- Pencil

1. Personal Data Sheet.

To insure systematic records, the Personal Data Sheet was prepared so that the name, date, age, and other information could be recorded in the appropriate places, to be filled out at the convenience of the examiner, from institutional and school records and from other divisions of the Brush Foundation. Figure 1 is a sample of the Personal Data Sheet used.

2. Record Blank.

After experimenting with several different kinds of blanks for recording the

¹ The Brush Foundation is the central partner in the program known as the Developmental Health Inquiry of the Associated Foundations.

² The preliminary work done with the Rorschach Method prior to the Brush project is described in detail in Hertz, M. R. Unpublished Thesis: The Rorschach Ink-blot Test. Western Reserve University Library, Cleveland, Ohio.

Serial No. _____

NAME _____ DATE _____ EXAMINER _____

AGE _____ DATE OF BIRTH _____ PLACE OF BIRTH _____

RACE _____ NATIONALITY _____ SEX _____

ADDRESS _____ MARRIED, SINGLE _____

SCHOOLING (indicate schools attended, and degrees, if any)

SCHOOL ATTENDING NOW _____ GRADE _____

Years attended school _____

OCCUPATION _____

NO. OF CHILDREN IN FAMILY _____

PARENTS _____

Father _____ Occupation _____

Mother _____ Occupation _____

Physical history _____

Social History _____

Social status; Very inferior, Inferior Average Superior

Very Superior

Educational Status: E. A. -- _____

Mental Status: M. A. _____ I. Q. _____

Personality Data _____

Figure 1. Personal Data Sheet.

Serial No.,.....

NAME

CA

DATE

R.T.	RESPONSE	SIGNA

Figure 2. Record Blank.

responses, the Record Blank shown in Figure 2 was adopted. Spaces were provided at the top for name, date and serial number. The remainder of the sheet was divided into three columns, a small column to the left for the Reaction Time (R.T.), a wide column for the "responses", and a third to the right for the "Signa" or scoring.

3. Trial Blot

It was observed in the preliminary experiment that the test scores were greatly influenced by the attitude of the subject toward the test, especially in the initial approach of the subject. Amusement at the novelty of the task, suspicion, shyness, fear, doubt, and superior attitudes all influenced the test results and in particular the responses to the first test card. In order to make the first card more comparable with the rest and to establish a favorable mental set at the beginning, it was decided to introduce a trial blot before passing to the regular series. Several blots were made of black ink on white paper and a few, very simple in design, were selected for use as trial blots. Only one trial blot was used for each subject. The trial blots differed, of course, from the others in that they were obviously "homemade", just ink on ordinary paper. This fact, however, seemed to aid the situation, since subjects readily understood what the blot designs were like and how they had been made. Figure 3 is a diagram of one of the trial blots used.

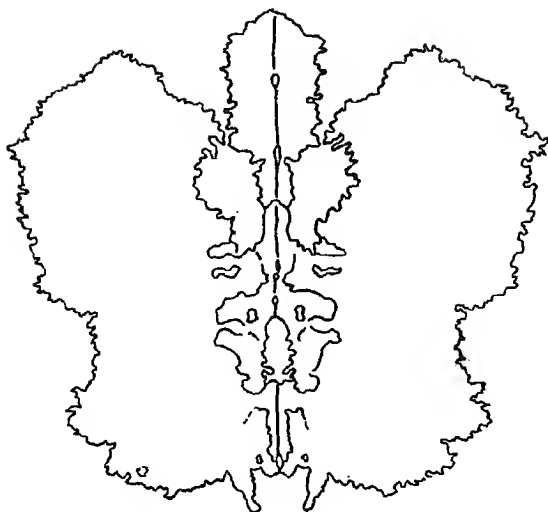


Figure 3. Trial Blot

It was felt that the introduction of the trial blot did not make any great change in the Rorschach method. As a matter of fact, Rorschach instructs that in the case of subjects who do not understand the nature of the test or who are suspicious, all necessary explanations should be made, even to the extent of demonstrating blots before them.

4. Diagrams

Diagrams of each blot which had been traced in ink, black and colored to correspond to the original designs, had proven so useful in the preliminary work, that they were retained and used.¹ The parts of the blots which subjects in the preliminary experiment had selected for interpretation had been assigned symbols, letters and numbers, which had been written on the diagrams. Figure 4 is a reproduction of the diagram for Card I, as prepared in the preliminary work and used in this project. It may be observed that the side figures of the blot are labelled "S", the whole middle portion "M", the "wings" at the sides "2", the tiny "claws", upper middle edge "1", and the space forms "6" and "7". These symbols had been assigned in the course of the preliminary work, as the details were selected, new numbers and additional letters being constantly inserted in the diagrams as subjects named new or different parts. It was found that within a short time, most of the usual details had been assigned symbols and it was not necessary to make further additions to the diagrams, except on rare occasions. It should be mentioned, also, that by the time that the Brush project was started,

¹ These diagrams are being reproduced in conjunction with the Frequency Tables which are being mimeographed by the Brush Foundation and which will be available.

CARD I

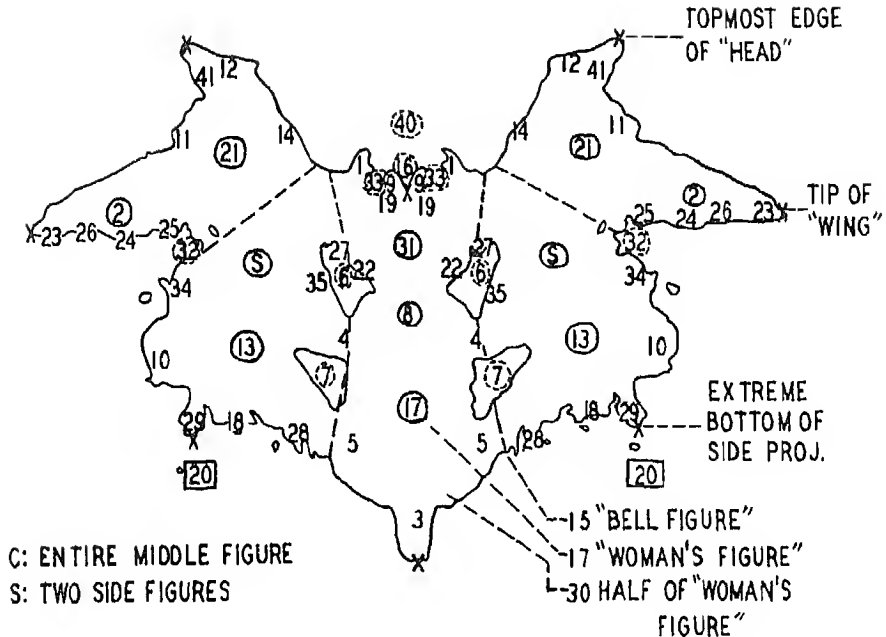


Figure 4.

the examiner knew most of the symbols and their respective location and it was unnecessary in the experiment proper to refer to the diagrams for all responses.

5. Tracing Sheets

Blank tracing sheets were also provided to be used in case it was extremely difficult to locate details by the use of the symbols. It was found in the preliminary work that the symbols and descriptive notes sufficed for the most part. Infrequently however, very unusual parts of the blots had been selected and tracing sheets were then put to use and filed with the record. Therefore tracing sheets were included in the equipment, cut into squares the size of the test card and arranged in a folder for use in case of necessity.

6. Summary Sheets

Figure 5 shows the Summary Sheet prepared to record Rorschach scores. Use of this record will be described in another paper, in the discussion on the standardization of the method of scoring.

			<u>Rorschach Psychogram</u>
Serial Number.....			Group.....
Name.....			Date.....
Age.....			
No. of Responses.....	Items.....	R. T.....	
No. of Failures.....			
<u>Mode of Response</u>	<u>Quality of Response</u>	<u>Content</u>	
W..... %.....	F.....	A..... %.....	
dW..... %.....	F+.....	Ad..... %.....	
D..... %.....	F-.....	%A.....	
Dr..... %.....	%F+.....		
Do..... %.....		H..... %.....	
DS..... %.....	M..... %.....	Hd..... %.....	
	Md..... %.....	%Hd.....	
Apper.Mode.....	C.....	Anat.... %.....	
Succ.....	CF.....		
	FC.....	Obj..... %.....	
	Sum Color...		
	F(c).... %.....	Arch.... %.....	
		Bot...., %.....	
		Geog.... %.....	
	Color Shock.....	Geol.... %.....	
		Fire.... %.....	
<u>Intelligence</u>		Mt..... %.....	
W.....		St..... %.....	
%F+.....		Sc..... %.....	
M.....		Wr..... %.....	
C.....	%.....	
%A.....	%.....	
%O+.....			
Apper.Mode.....	P..... %.....		
Succession.....			
<u>Erlebnistypus</u>	O..... %.....		
M : C	O+.....%		
	O-.....%		
<u>Personality Data.</u>			

Figure 5.- Scoring Sheet

Procedure

The material was placed in folders, all appropriately labelled, so arranged that one folder fitted into another, the whole making up one large folio of Rorschach material. Separate folders held the Personal Data Sheets, Record Blanks, Trail Blots, the standard series of ink-blot arranged upright I through X, Tracing Sheets, Diagrams I through X, and Summary Sheets.

The subject and the examiner were alone in the room, seated before a desk, the subject to the side and a little in front of the examiner, facing away from the desk. The examiner could look over the subject's shoulder and could watch him as he pointed to different parts of the blots. The cards, in appropriate order, face down, were on the desk, the trial blot on the top visible to the subject. The portfolio with the diagrams was within reach of the examiner, closed, for reference if necessary. No diagrams were visible to the subject. The examiner had record blanks before her, stop watch in her left hand ready to be started at the first response of the subject, pencil poised in the other hand, ready to record responses.

Uniform directions, prepared and memorized by the examiner, were given: "I am going to show you some cards, one by one. The cards have designs on them made up of ink-blots. I want you to take each card in your hand, look at it carefully and tell me what you think it could be, what it looks like to you. You may hold the card any way you wish, but be sure to tell me everything that you see in the design. When you have finished with a card, you may give it to me and I'll give you the next card." If you do not understand, ask me any further questions.....

"For example, look at this card and tell me what you think it could be. What does it look like to you?Anything else?Does it look like anything else?"

While these directions were given, the examiner showed the Trial Blot and turned it on all sides to indicate it may be viewed from all angles. She showed that the card must be held within the arm's length.

When the subject gave answers, he was encouraged by such remarks as "Yes, it does look like that", or "That's what I said, too", "So many people say that", or "Why that's an interesting answer".

For cautious or recalcitrant subjects, the examiner added: "You know these are only ink-blots. You simply put a drop of ink on a piece of paper, fold it, press the sides together and you get one of these forms or designs. These blots look like different things to different people. We want to know what they look like to you. Now what do you think this can be?"

If the subject hesitated still, the examiner said: "There is no right or wrong to any answer to these blots. They are just ink-blots. All I want you to tell me is what they look like to you, what do they make you think of."

Questions of the subject were answered to the best ability of the examiner.

At no time, of course, was any suggestion given that would indicate to the subject that the whole blot was to be interpreted or certain details selected or that some special kind of answer was to be preferred. After the subject gave all the responses he could to the Trial Blot and when it was certain that he understood the nature of the task, the test proper was begun. If full cooperation was not obtained, the examination was not attempted.

Taking the Trial Blot away, the examiner said: "You have the idea, now. Tell me what you think this could be? What does this look like to you?" The examiner presented Card I, starting the stop watch with her left hand. The reaction time was noted in the first column, from the time the card was made visible until the first response was given.

In the preliminary work, the reaction time for each card was recorded from the time it was exposed until it was returned. The results showed variations not only among various individuals but also in the same individual for the different test cards. One card elicited numerous responses while another card brought forth only a few. One card was returned in a short time while another was kept for several minutes. Response data were therefore divided most unevenly.

It was further observed that two minutes generally sufficed for reactions to each card. Therefore in order to standardize conditions of the test, it was decided to limit the time to two minutes per picture, allowing twenty minutes for the entire test proper, not including time for instructions, explanations and discussion. The time limits adopted agree with Rorschach's estimate that for normal subjects, the test should take between 20 and 30 minutes.

Since Rorschach considered color-shock significant, i.e. the phenomenon evidenced by a longer pause between the colored ink-blot and the response, it was decided to record the speed of the first reaction. The stop-watch was therefore started the instant the card was presented to the subject and the time recorded when the first response (not the first remark or exclamation) came. The subject was permitted to give answers until two minutes had elapsed. The responses were taken down verbatim, with notes pertaining to attitudes, gestures, comments, mannerisms, certainty or hesitancy and the like. Such behavior notes were taken throughout the course of the test.

Symbols were used to indicate the position of the card (the "V") and the location of the parts of the blot which were selected for interpretation. The diagrams were referred to, when necessary. At times, tracings were made and attached to the record.

Care was taken not to exercise pressure or compulsion. Every attempt was made to secure maximum cooperation of the subject, even to making ink-blot designs. Free conversation was permitted before and during the test. If the Subject was curious, the examiner did not hesitate to discuss the test, avoiding of course all suggestions which would stimulate a definite mental set toward the subsequent pictures.

After two minutes had elapsed, the examiner asked questions indirectly and

cautiously about those responses about which she was doubtful, in an effort to elicit information concerning mode of response, - whole or details and which details, - and the factors which had influenced the interpretations, - form, movement, color or shading. Care was taken to avoid any suggestion that a special kind of answer or a particular detail bore more weight than others. Questions of the following nature were asked, for example:

Card I. "a mask". Question: "What made you say this was a mask?" "Will you explain it to me more fully?" Then the subject generally explained that the spaces made him think of "eyes, nose, and mouth".

Card I. "two angels revolving around a pole". "What made you say that? Will you show me where you see those angels? and the pole?"

Card I. "an acrobat act". "Why do you say that? That's an interesting answer". The subject pointed out "an acrobat is on one side, another man on the other, holding a third in the middle; they are balancing themselves" (shows the movement).

It cannot be overemphasized that the examiner must get as much help as possible from the subject at the time of the examination in order to render the scoring as accurate and reliable as possible. Despite the fact that many examiners object to asking questions after each card, it was found more effective to ask some "safe" questions than to wait until the end of the test for all questions. Frequently between 25 and 50 responses were given by subjects. It was observed in the preliminary work that many of the subjects forgot where certain answers had been located or what had originally motivated their interpretations, when questions were delayed until the end of the test. The result was that many of the answers were doubtful and could not be scored accurately. It was therefore decided to discuss answers at least in part after each card where necessary. Extreme care was taken not to suggest the classifications or categories that are scored. It was felt that no harm was done in making some cautious inquiries after the two minute period had elapsed and a greater measure of accuracy was attained. All further questions were delayed until the end of the test, the examiner indicating by means of a check placed in the margin that further questioning was necessary.

After all discussion had been finished, Card I was placed face down and Card II presented, stop-watch started and the same procedure followed as for Card I.

Card II introduces color. As suggested above, cautious questions were asked after the time limit to get explanations for some of the doubtful answers in reference to pure color, color-form, form-color, form, movement or shading. Card II, was interpreted, for example, on many occasions as "two clowns". The subject was asked, "Why do these look like clowns to you?". Some subjects referred to the red thus: "It looks like red caps on two men so that the men are all dressed up like clowns". This would indicate the influence of color and make the answer a

form-color answer. Many more subjects explained this answer in terms of movement. "The figures look like two men jumping up and down like this, clapping their hands together, or doing tricks".

Again, Card II was interpreted when inverted as "a sunset going down over the mountain". "Why?". "Because this red here is the color of fire and the rays are coming out like the rays of the sun. It seems to be over a mountain and here's the reflection below".

Card II was frequently interpreted as "a volcano". "What gives you the impression of a volcano" was asked. Some subjects emphasized the "red exploding" showing the color; others mentioned the "hole in the center of the mountain" pointing out the space detail.

This procedure was followed for all ten cards. After the cards were completed, the examiner returned to the doubtful answers and asked further questions. For example, for Card II, the answer "butterfly" was given for the whole blot. "Would this look like butterfly to you if it were all black?" was asked, in order to determine the relative influence of the form and the color. Every effort was made to get the assistance of the subject while the subject was available. All answers and remarks were, of course, carefully taken down. Figure 6 is a reproduction of a part of a Rorschach record with all the details and explanations noted.

Reliability of the method of administration.

Report has already been made of the application of the Rorschach method in this form to a group of 300 students of Patrick Henry Junior High School, Cleveland, Ohio, ages ranging from 12 years 6 months to 16 years 5 months (9). Report has likewise been made of the reliability of the Rorschach factors as modified by the Brush Foundation (8). On the basis of 100 records selected at random from the group of 300, reliability coefficients for most of the test factors computed by the corrected split-half method were considered highly satisfactory. When these were compared with the indices of reliability in the preliminary experiment where some general factors were considered, it was observed that the reliability of the test has been considerably increased. The standardization of the method of administration, especially the limitation of the time of exposure, was thought to account in part for the better results obtained.

Subsequent modification of the Rorschach method of administration

The Rorschach method of administration has been further modified at the Brush Foundation, in two respects. First, mimeographed copies of the ink-blot are utilized, as originally suggested by Vernon (31). These are used, however, only in place of the blank tracing sheets when there is doubt as to the location of the response. Mimeographed copies of the blots are placed in folders with their appropriate diagrams, ready for use when necessary. When an answer cannot be located easily by means of the symbols on the diagrams, the mimeographed sheets are used. Answers are written down on the record blanks with the rest of the answers, a star is placed next to them which indicates that there is a mimeographed sheet attached to the record. On this sheet are the necessary explanations. Of course,

Name Jane Doe CA. 10 Serial Number 6308
 Date Jan. 3, 1931

R.T.	Responses	Scoring Signs
I. 20"	(timid, cautious, looks around, hesitates) well it might ^ be, no, well I guess it is a bat (W), see those wings (2), yes it's a bat; the wings are outspread.// ^ or it could be a bird too (W)// v holding it this way, it might be a Chinese Temple, because it has a kind of tower (3) and funny kind of windows (6, 7) // ^ this is sort of a bell here (15) I just can't see anything else, really (gives up in 1'30")	
II. 10" ✓ ✓	^ well, I guess this is two dogs holding something up (W) that's quite plain (puts fingers in mouth, fidgets) // ^ a butterfly with wings (W) // v a mountain scene, the sun setting, and I guess this is the reflection below (W esp. 3, 4). Funny how if you look, you can see something, isn't it? // can I say just about this part? Well if you hold it v this way, it looks like a king's head (7) // (gives up - 1'55") (in answer to questioning) ^ it's a butterfly because I see these wings here, don't you see them? and the color (3, 4) is so pretty, too? v the sun is setting here, see how those rays come out and see how the red is reflected below. I think it is a real pretty scene.	
III. 33" ✓ ✓	^ well, first I see a butterfly (5), these are wings and here's a middle, I'm sure it's a butterfly // ^ oh, here's two men, funny men, bending over a pot cooking something I guess (W) // ^ up here are two parrots on sticks (4) > these could be fish (2) v this could be a negro-head That's all (2') (in answer to questions) If this butterfly were all like this (points to the black) it would still be a butterfly. It looks more like a butterfly because it is in red, though. These parrots are perched on sticks. It's plain, can't you see them up there; they are red and the stick is red. I guess it would have been better if there had been more colors	

Figure 6.- Rorschach Record Blank

as many mimeographed diagrams may be used as are necessary. Frequently none are called into service.

This method of combining the use of the symbols and the mimeographed diagrams appears to be the most effective technique that has been used at the Brush Foundation to date. Report will be made in another paper on the statistical reliability of the method of administration as developed.

In addition, unlimited time is now permitted the subjects, the two minute period being indicated and also the total reaction time for each card.

Conclusion

A review of the investigations made with the Rorschach ink-blot test emphasizes the deplorable lack of uniformity in the administration of the test. There is little doubt that if individuals were examined simultaneously by different Rorschach examiners using their respective and individual methods, the resulting records would contain many discrepancies. The scoring and interpretation would likewise be inconsistent in many respects. Further the norms amassed by different examiners could not be compared for research purposes or applied practically in clinical procedure because of the diversity of methods used.

It would seem most urgent for Rorschach examiners to concentrate on this phase of their problem and to determine upon a uniform method of giving the test. Recently the writer was requested to cooperate with several other Rorschach examiners in this country and abroad, in a joint project of scoring the same records in order to test the accuracy of the scoring method. It was impossible to score the records sent to her because many of the answers had been recorded without sufficient information concerning the location of details and the factors influencing the responses. Later, other records were furnished with accompanying tracings to assist in locating some of the answers. In many instances, even these tracings were inadequate and the writer had to indicate that many of her scores were doubtful.

Such a project is highly worthwhile. It is obvious, however, that the method of giving the test and of recording the responses must be standardized to some degree before such a project should be undertaken.

The procedure worked out at the Brush Foundation as outlined above seems to be satisfactory and offers promising results. It is presented here tentatively in the hope that it will stimulate cooperative action and lead to a refinement of at least the method of giving the test. There can be no doubt that the future of the Rorschach technique depends in large part upon the development of a standardized method which will be used universally by all Rorschach examiners and which will give strictly comparable results.

REFERENCES

- (1) Beck, S. J.: Personality diagnosis by means of the Rorschach test. Am. J. Orthopsychiat., 1930, 1, 81-88.

- (2) Beck, S. J.: The Rorschach test and personality diagnosis. *Am. J. Psychiat.*, 1930, 10, 19-52. Also in *Institute for Child Guidance Studies* (L. G. Lowrey, Ed.) pp. 222-261. New York: Commonwealth Fund, 1931.
- (3) Beck, S. J.: The Rorschach test as applied to a feeble-minded group. *Arch. of Psychol.* 1932, 21, no. 136, pp. 84.
- (4) Ganz, E. et Loosli-Usteri, M.: Le test de Rorschach appliqué à 43 garçons anormaux. *Arch. Psychol.*, Genève, 1934, 24, 245-255.
- (5) Guirdham, A.: The value of the Rorschach test. *J. Ment. Sci.*, 1935, 81, 848-869.
- (6) Harriman, P. L.: The Rorschach test applied to a group of college students. *Am. J. Orthopsychiat.*, 1935, 5, 116-120.
- (7) Hertz, M. R.: The Rorschach ink-blot test: historical summary. *Psychol. Bull.*, 1935, 32, 33-66.
- (8) Hertz, M. R.: The reliability of the Rorschach ink-blot test. *J. Appl. Psychol.* 1934, 18, 461-477.
- (9) Hertz, M. R.: Rorschach norms for an adolescent age group. *Child Development*, 1935, 6, 59 - 78.
- (10) Juarros, C. and Soriano, M.: Le Psychodiagnostic de Rorschach chez les enfants anormaux. *Comptes Rendus de la IV Conf. Int. de Psychotechn.*, pp. 595-605. Paris: Alcan, 1929. Also in Spanish: *Siglo méd.* 1927, 80, 413-417.
- (11) Kerr, M.: The Rorschach test applied to children. *Brit. J. Psychol.* 1934, 25, 170-185.
- (12) Levy, D. M. and Beck, S. J.: The Rorschach test in manic-depressive psychosis. *Manic-Depressive Psychosis* (W. A. White et al.), pp. 167-181. (Proc. XI Meeting, Assoc. Res. Nerv. and Ment. Dis. 1930) Baltimore: Williams and Wilkins, 1931.
- (13) Linares Maza, A.: Investigaciones con el psicodiagnóstico de Rorschach en niños normales españoles. *Arch. de Neurobiol.* 1932, 12, 693-738.
- (14) Line, W. and Griffin, J. D. M.: Some results obtained with the Rorschach test, objectively scored. *Am. J. Psychiat.*, 1935, 92, 109-114.
- (15) Loosli-Usteri, M.: Le test de Rorschach appliqué à différents groupes d'enfants de 10 - 13 ans. *Arch. de Psychol.*, 1929, 22, 51-106.
- (16) Loosli-Usteri, M.: La conscience du hasard chez l'enfant. *Arch. de Psychol.*, 1931, 23, 45 - 66.
- (17) Löpfe, A.: Über Rorschachsche Formdeutversuche mit 10 - 13 jährigen Knaben. *Ztschr. f. angew. Psychol.*, 1925, 26, 202 - 253.
- (18) Mac Calman, D. R.: The Rorschach test and its clinical application. *J. Ment. Sci.* 1933, 79, No. 325, 419 - 423.
- (19) Mandowsky, C.: Über die Bedeutung des Rorschach'schen Formdeutversuchs. *Die Biologie der Person.* (ed. T. Brugsch and F. H. Levy), 1931, 2, 104-1059.
- (20) Mira, L. E.: Sobre el valor del psicodiagnóstico de Rorschach. *Progresos de la Clinica*, 1925, 808-845.
- (21) Mira, L. E.: Exploración de la afectividad. *Rev. méd. de Barcelona*, 1930, 14, 222 - 259.
- (22) Monnier, M.: Le test psychologique de Rorschach. *Encéphale*, 1934, 29, 189 - 201; 247 - 270.
- (23) Müller, M.: Der Rorschachsche Formdeutversuch, seine Schwierigkeiten und Ergebnisse. *Ztschr. f. d. ges. Neur. und Psychiat.*, 1929, 118, 598 - 620.

- (24) Oeser, O. A.: Some experiments on the abstraction of form and colour.
Part II. Rorschach tests. *Brit. J. Psychol.*, 1932, 22, 287-323.
- (25) Pfister, O.: Ergebnisse des Rorschachschen Versuches bei Oligophrenen.
Allg. Ztschr. f. Psychiat., 1925, 82, 189-223.
- (26) Powell, M.: Relation of scholastic discrepancy to free associations on the
Rorschach tests. *Kentucky Person. Bull.*, 1935, No. 14.
- (27) Rorschach, H.: Psychodiagnostik: Methodik und Ergebnisse eines wahrneh-
mungsdiagnostischen Experiments. Bern: Bircher, 1921, pp. 174.
- (28) Rorschach, H. and Oberholzer, E.: Zur Auswertung des Formdeutversuchs für
die Psychoanalyse. *Ztschr. f. d. ges. Neur. und Psychiat.*, 1923, 82,
240-274. Also translated : Application of the interpretation of form to
psychoanalysis. *J. Nerv. and Ment. Dis.* 1924, 60, 225-248; 359-379.
- (29) Rorschach, H.: Psychodiagnostik. Berlin: Huber, 1932, pp. 227. (Con-
tains #27 and #28)
- (30) Salas, J.: El psicodiagnóstico de Rorschach. *Arch. de neurobiol.*, 1932,
12, 316 - 339.
- (31) Vernon, P. E.: The Rorschach ink-blot test. *Brit. J. Med. Psychol.*, 1933,
13, 89 - 118; 179 - 200; 271 - 291.
- (32) Vernon, P. E.: Recent work on the Rorschach test. *J. Ment. Sci.*, 1935,
81, 894 - 920.

THE EFFECT OF WIDE DIFFERENCES IN THE EDUCATION OF PARENTS
UPON THE BEHAVIOR OF THEIR CHILDREN

POLLY BOUCK¹

Studies have been made of numerous factors in family relationships as influencing behavior problems in children. The ordinal position of the child in the "family constellation," family size, age and I.Q. differences, and sex of siblings have all been checked from this standpoint. To the best of the writer's knowledge, however, this article records the first attempt to discover what effect, if any, is produced in the tendency of a child toward problem behavior by the existence of a marked difference between the educational backgrounds of his two parents.

It would be a reasonable armchair assumption that some such effect might be observable. There is, too, a certain amount of clinical evidence that behavior problems can in some cases be traced to the incompatibility resulting from wide differences in the parents' educational accomplishments. Thus Sayles (5), in discussing the case of an eight-year-old girl who had come to the attention of a guidance clinic (p.48), says, "The father,... had put himself through college and was inordinately proud of himself and his accomplishments; the mother, who had gone only part way through high school, was 'full of humility and revolt'--feelings which were kept at a high pitch by her husband's jeering attitude toward her efforts at self-education." Howrer (3), in his classification of "family tensions," includes cultural differentiations (p. 207). Lindquist (2) considers education important as affecting the philosophy of life, abilities, and personalities of the marriage partners (p. 66). D. M. Levy (1), in considering maternal over-solicitude, mentions as significant factors thwarted careers and lack of social interests in common with the husband - which might be due to educational differences.

Attempting to discover whether any real relationship exists between wide divergences of education in the parents and problem behavior in children, the present study made use of actual home situations. Two groups of thirty-four matched pairs of children were used. The cases were selected from children brought to the University of Minnesota Institute of Child Welfare for routine mental tests. These children were not regarded as special "problems"; the reason for bringing them was general interest in their level of development. This point should be kept in mind in interpreting the results, since if the subjects had been chosen from a group of "problem" children, more clear-cut results might have appeared. The age-range of the subjects was from four to eleven years with half the cases concentrated at the ages of seven and eight.

The children were divided into two groups - those whose parents had about the same amount of education composed the control group, while the experimental group consisted of those whose parents' educational background showed a difference of at least four years. The median educational gap was six years. The families

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studied were all in the three upper groups of the socio-economic scale,¹ and the children's I.Q.'s ranged from 89 to 146, with the median at 114. Each member of the experimental group was paired with a control, matching on the basis of age, sex, I.Q., age of parents, education of father, and ordinal position in the family. In the control group the mother's and father's education differed in no case by more than three years.

Information was secured during home interviews, by the following means:

1. General Questionnaire. A questionnaire designed to disclose aspects of home behavior and treatment. This was filled out by the investigator during the interview with the mother. Questions were included on the child's health, appetite, sleep, behavior and personality difficulties, home habits, school life, social life, and parents' interests and activities.

2. List of Behavior Traits. The list, which was taken from that used by Wickman (6) in his study of teachers' attitudes toward children's behavior, was marked by the mother according to the frequency with which she observed each form of behavior in her child.

3. Play List. A short list of plays, games, and amusements. This was marked by the interviewer, who questioned the child as to which of the activities he engaged in, liked, or disliked.

4. Rogers Personality Adjustment Test (4). Children of nine or over (excepting one pair) and some of the brighter eight-year-olds were given a slightly abbreviated form of this test.

RESULTS

Data from the "Behavior Traits" records were manipulated as follows: The frequency marked for each trait was used as the child's score for that trait. Then 1. separate average scores were computed for the experimental and control groups for each trait; 2. total average scores were obtained for the experimental and control groups; 3. a total problem score was obtained for each child. Scores for certain groups of traits were also computed; 1. "withdrawal" traits, including shyness, daydreaming, oversensitiveness, sullenness, fearfulness, unhappiness, carrying grudges, suspiciousness; 2. "serious"² traits, including shyness, oversensitiveness, sullenness, fearfulness, unhappiness, stealing articles or money, suspiciousness, domineering, cruelty or bullying.

Comparative results for the two groups are presented in the following tables:

¹ Minnesota Scale. Group I (professional) 10 cases; Group II (semi-professional and managerial) 6 cases; Group III (clerical, skilled trades, and retail business) 18 cases.

² Traits judged as "serious" by mental hygienists, in Wickman's investigation (6).

TABLE 1

Traits In Which Control Mean Exceeds Experimental Mean

	Mean	Range	S.D.	S.D. m	Diff.	S.D. Diff.	$\frac{\text{Diff.}}{\text{S.D. Diff.}}$
<u>Total Score</u>							
E	27.4	3 to 50	11.40	1.95			
C	29.4	10 to 44	7.99	1.37	2.00	2.39	.84
<u>Daydreaming</u>							
E	.85	0 to 3	1.03	.18			
C	1.20	0 to 3	1.10	.19	.35	.26	1.36
<u>Interrupting</u>							
E	1.47	0 to 3	.98	.17			
C	1.85	0 to 3	1.00	.17	.38	.24	1.59

TABLE 2

Traits In Which Experimental Mean Exceeds Control Mean

	Mean	Range	S.D.	S.D. m	Diff.	S.D. Diff.	$\frac{\text{Diff.}}{\text{S.D. Diff.}}$
<u>Serious Problems</u>							
E	5.56	0 to 12	2.33	.40			
C	4.56	0 to 10	2.55	.44	1.00	.59	1.69
<u>Over-sensitiveness</u>							
E	1.65	0 to 3	1.21	.21			
C	1.03	0 to 3	.92	.16	.62	.26	2.38
<u>Domineering</u>							
E	1.24	0 to 3	1.17	.20			
C	.76	0 to 3	.80	.14	.48	.24	1.99
<u>Problems, General Questionnaire</u>							
E	8.56	0 to 26	5.83	.99			
C	7.53	0 to 16	3.99	.68	1.03	1.21	.85
<u>Withdrawal Traits</u>							
E	5.15	0 to 11	3.27	.56			
C	4.91	0 to 10	2.64	.45	.24	.721	.33

Traits showing greater incidence in the control group outnumbered those of the experimental group more than four to one. Arranged in descending order of the statistical significance of the difference, traits appearing more frequently in the control children were stubbornness, lying, inattentiveness, stealing articles, meddling, stealing food, acting "smart," carelessness, destroying property, nervousness, disobedience, masturbation, enuresis, fearfulness, stealing money, lack of interest, slovenliness, temper outbursts, rudeness, cruelty or bullying, profanity, tattling, sullenness, cheating, unhappiness. The standard error of the difference ranges from 2.6 for stubbornness to .40 for unhappiness. In the experimental group, greater incidence was found in the following traits; imaginary tales, shyness, impertinence, sissy or tomboy behavior, quarrelsomeness, and overactivity, the standard error of the difference ranging from 1.32 for imaginary tales to .37 for overactivity.

When the individual problems are considered the odds are certainly against the control group. But the experimental group shows a considerably larger incidence of serious problem traits, taken as a whole, than the control group.

The ten members of the experimental group whose parents' education differed most widely were compared with the ten in the experimental group whose parents had the most nearly equal amounts of education. Table 3 shows the results obtained:

TABLE 3

Relation of Problem Scores to Amount of Parents' Educational Divergence

	Mean	Range	S.D.	S.D. m	Diff.	S.D. Diff.	Diff. S.D. Diff.
<u>Total Score</u>							
Widest	31.4	18 to 50	9.81	3.10			
Narrowest	26.8	13 to 39	11.57	3.66	4.6	3.31	1.39
<u>Withdrawal Traits</u>							
Widest	6.5	1 to 11	2.87	.91			
Narrowest	4.5	0 to 10	3.58	1.13	2.0	1.45	1.38
<u>Serious Problems</u>							
Widest	7.3	3 to 12	2.58	.82			
Narrowest	4.7	0 to 11	4.10	1.30	2.6	1.54	1.69
<u>Problems from General Questionnaire</u>							
Widest	10.2	4 to 26	6.62	2.09			
Narrowest	7.2	0 to 16	5.97	2.28	3.0	3.09	.97

The fact that these differences are all in the expected direction tends to strengthen the supposition that there is some relation between educational differ-

ences of parents and children's behavior, as a group trend.

FURTHER FINDINGS OF THE STUDY

1. Comparison of the Problem Scores. The scores were compared for twelve children whose mother's education exceeded the father's, and twenty-two children whose father's education exceeded the mother's. The differences were found to be extremely slight. For each group of traits, however, the problem score tended to be higher for the group whose fathers had more education than the mothers. In view of this fact, correlations were obtained for the entire group between mother's education and three of the problem scores, with the following results:

	r	P.E.
Mother's education and low total problem score	+0.054	.082
Mother's education and low withdrawal score	+0.053	.082
Mother's education and low serious problem score	+0.110	.081

The correlation is in the expected direction, but so low as to be negligible.

2. General Questionnaire. Few of the scores showed any appreciable differences between the two groups, though the experimentals exceeded the controls rather markedly in irresponsibility. There appeared to be a slight tendency for the experimentals to be less well adjusted socially. In their willingness to accept responsibility, for instance, the controls were a long jump ahead of the experimentals. More of the experimentals seemed to be ill at ease with adults, and a larger proportion of them preferred solitary play or reading to social play. The experimentals attended movies more often than did the controls, and took (generally) a less active and less willing part in home duties. More of them, too, receive no spending money. In regard to the controls, "talking too much" was given much more frequently as a source of annoyance than in the case of the experimentals.

3. Rogers Personality Adjustment Test. This was given only to ten pairs of children, the older or brighter ones. The scores indicated that for these particular cases, even more than for the group as a whole, the experimental children exceeded the controls in withdrawal traits and in serious problems. Four out of five of the highest scores in family maladjustment were made in the experimental group. On the whole, it was found that the Rogers test did not appear to single out to any appreciable extent the same children whom the other criteria made out to be maladjusted. This may have been due to differences in the content of the data.

4. Play Interests. Judged by the score of plays and games liked, engaged in, disliked, and never played, there appeared to be a very narrow advantage in favor of the control group. Of the ten children having the highest "serious problem" score, five were among the ten liking the least number of play activities, and four of these five had withdrawal scores that ranked among the worst ten. On the other hand, none of the children having a low withdrawal or serious problem score appeared among those having the highest play scores. Thus, while a lack of interest in play may be symptomatic of poor adjustment, a high play score does not necessarily seem to be an indication of especially good adjustment.

5. Parents' Recreational Interests. There was some indication that problem scores tend to be lower in children of mothers who have a number of social interests. In this study it was found that mothers of children in the control group tended to be somewhat more interested in social activities outside the home than were the mothers of the experimental group. Further, children of the more socially inclined mothers in both groups tended to exhibit fewer problem traits - confirmation, to some extent at least, of the acknowledged salutary effect of a certain amount of "letting alone."

DISCUSSION OF RESULTS

There is discernible in the results of the various tests given, a slight but fairly consistent tendency for the children in the control group to be better adjusted. The experimental group exhibits a noticeably greater number of problems that mental hygienists consider serious. The apparent influence of a wide difference between parents' education on the incidence of serious behavior problems in their children becomes more striking when we compare the group having the least educational divergence with that having the most. At the same time, it must be said that there is not one difference which, when interpreted in the light of its standard error, reaches that desirable magnitude so pridefully referred to in some circles as "practical certainty." There are tremendous individual differences and a great deal of overlapping between the two groups.

It is obvious that all the results obtained in this investigation were subject to numerous sources of error. The group studied was small, and despite the careful matching of as many objective factors as possible, there were many immeasurable factors that could not be controlled. On the part of both the investigator and the parents interviewed, there was bound to be variation in the interpreting of terms, though it may reasonably be supposed that coloring of results was not more frequent in one group than in the other. The writer is inclined to interpret the results as "somewhat positive," while emphasizing the fact that wide individual variation was evident among the members of both groups.

SUMMARY

In this study of thirty-four matched pairs of children, the parents of the experimental group differed four years or more in the amount of their education, while those of the control group had approximately equal amounts of education.

The children in the control group were found to exceed those in the experimental group in the incidence of problem behavior as a whole, but the children of the experimental group more frequently displayed problems considered by mental hygienists as serious.

The children in the experimental group were a little less well adjusted socially, and less mature in the assumption of responsibility. They were also slightly behind the control group in participation in and liking for play activities common to their age levels. The control group, however, made the poorer showing on the Rogers Personality Adjustment Test, with the possible exception of family maladjustment.

Mothers having markedly social interests reported less problem behavior in their children than did mothers whose chief interest was in home activities or solitary forms of recreation.

Virtually none of these results was clear-cut, and there was wide individual variation in all respects in both groups.

REFERENCES

- (1) Levy, D. M.: Address before American Psychiatric Association and Social Science Research Council. *Am. J. Psychiatry*, 1930, 9, 900-904.
- (2) Lindquist, Ruth: *The family in the present social order*. Chapel Hill, Univ. of North Carolina Press, 1931.
- (3) Mowrer, E. R.: *Family disorganization*. Univ. of Chicago Press, 1927.
- (4) Rogers, C. R.: "Measuring personality adjustment in children nine to thirteen years of age." *Teach. Coll. Contrib. Educ.*, 1931, No. 458.
- (5) Sayles, Mary B.: *The problem child at home: A study in parent-child relationships*. New York: The Commonwealth Fund, 1928.
- (6) Wickman, E. K.: *Children's behavior and teachers' attitudes*. New York: The Commonwealth Fund, 1928.

THE RELIABILITY OF ANTHROPOMETRIC MEASUREMENTS TAKEN ON
EIGHT- AND NINE-YEAR-OLD WHITE MALES

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INTRODUCTION

Available reports of anthropometric research are sufficient to enable one to make a reasonably complete description of the physical growth of the normative or average white child between infancy and maturity. In contrast, the situation is almost the reverse when one attempts to go beyond the normative child to investigative work directly concerned with the course of physical growth for the individual. Research publications to date include but a meager scattering of findings having reference to age-to-age trends for the individual in either body dimensions or body proportions.

Many of those now engaged in physical growth research are cognizant of this present status of the field and, consequently, are placing major emphasis on the need for longitudinal studies. At numerous research centers there are consecutive measurement programs in process which are primarily intended to yield information on the growth of the individual child. It is becoming increasingly evident, however, that to investigate the growth of the individual is a technically difficult task.

Lincoln (1) presented experimental evidence to show that even where data are collected by trained anthropometrists it does not follow that they are of such accuracy that only negligible differences occur from observer to observer or upon immediate repetition by the same observer. The writer has recently examined series of individual curves for four dimensions of the trunk. These curves covered the age period from seven to sixteen years and were drawn in part to semiannual observed values and in part to annual increment values. A large number of the curves showed abrupt irregularities which were obviously spurious, while almost all the trends were characterized by fluctuations most probably due to errors of measurement (See, for instance, p. 102, Plate B). In view of the fact that the data for these trends had been accumulated at two major research centers, it would appear that if measurement artifacts are not to minimize seriously the value of individual curves the basic measurements must approximate perfect reliability. Certainly for the study of such refined problems as seasonal variations in growth or the influence of childhood diseases on growth (if it is possible to study these factors for the individual), determination of the serial measurement values will demand unusual precision.

PURPOSE

The above discussion is considered to imply that the planning of long-term studies of physical growth - studies intended to elucidate the growth of the individual child - will be facilitated by research investigations which indicate

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the degree of accuracy of measurement obtainable on various parts of the living body at different stages of its development. It is the purpose of this paper to report such an investigation for a series of physical measurements made on eight- and nine-year-old white males. Specifically, the aim of the present study is twofold: first, to present reliability tables for each of fifteen anthropometric dimensions, these tables to be derived from measurement observations taken under relatively optimum (in contrast to routine) conditions; secondly, to relate each reliability table to the rate of growth for the dimension it represents. This latter procedure is intended to yield an estimate of the time frequency at which consecutive measurements for each of the dimensions under study are profitably made.

MEASUREMENTS

The fifteen anthropometric dimensions selected for study are itemized below. Each item is complemented by a descriptive statement of the measurement technique employed in determining the dimension.

Stature: The instruments used were the Baldwin Paper Measuring Scale and Square. The subject stood erect with heels almost touching each other. Heels, buttock, upper part of back, and rear of head were against the wall to which the scale was attached. The arms were permitted to hang at the sides of the body in a natural position, the heels were in firm contact with the floor, and the head was held on the Frankfort Horizontal. One face of the square was so placed against the scale that the other face was horizontal with the floor. The anthropometrist then brought down the square with sufficient force to crush the subject's hair and made the reading.

Sitting Height: The instruments were the same as for stature. The subject sat on a horizontal walnut bench 30 centimeters in height. His knees were flexed and spread apart, his ankles crossed, and his hands rested on his thighs. The posterior aspect of the trunk made contact with the scale both at the sacral region and at the thoracic region. The square was brought down firmly on the vertex (the highest point of the head when held on the Frankfort Horizontal) and the measurement recorded as the distance from this point to the surface of the bench.

Bi-acromial Diameter: Standardized large sliding calipers having broad flat branches were used in taking this measurement. The subject assumed the erect position with his arms hanging at his sides. In an attempt to standardize this diameter as much as possible, the anthropometrist stood behind the subject and drew back the subject's shoulders until the bodies of the two scapulae lay approximately in one plane. The measurement was determined as the distance between the most lateral points of the acromial eminences.

Bi-iliac Diameter: This measurement was taken as the straight distance between the most lateral points of the crests of the ilia. The instrument used was the same as for the previous dimension. The observer stood in front of the subject, brought the face of each branch of the calipers squarely in contact with the landmark, and applied the maximum pressure that could be exerted without pain to the subject. In the event that the subject appeared to turn his trunk and

hips at the time the pressure was applied, the measurement was checked.

Bi-trochanteric Diameter: The subject stood erect with legs together and feet parallel. The most external prominences of the greater trochanters were the terminal measurement points. Pressure was applied to the large sliding calipers until considerable resistance of the bones was felt.

Bi-condylar Diameter of Humerus: This measurement was taken on the upper left extremity by means of the large sliding calipers. The left arm of the subject was raised forward to approximately the level of the shoulder and the forearm flexed upward at right angles to the arm. The branches of the calipers were then applied against the epicondyles of the humerus in such a manner as to bisect the angle of the elbow and lie in the plane of the arm and forearm. Heavy pressure was used, care being taken that the forearm did not move out of line with the branches of the calipers and tip in toward the midline of the body.

Bi-condylar Diameter of Femur: Here the large sliding calipers were used and the maximum straight distance obtained between the condyles of the left femur. The knee of the subject was flexed sufficiently to relax and largely remove the musculature at the lateral aspects of the condyles. The branches of the calipers bisected the thigh-leg angle as they were brought in contact with the bony prominences. Considerable pressure was used. The anthropometrist stood in front of the subject while taking this measurement.

Circumference of Thorax: A steel millimeter tape was used to determine this measurement. The subject stood in a natural manner with head erect and with arms relaxed and held slightly away from the sides of the body in order to permit the passing of the tape around the thorax. The observer stood in front of the subject and, using the xiphoid cartilage of the sternum as the anterior landmark, placed the tape around the thorax at right angles to the spinal column. Posteriorly, the tape always rested below the inferior angles of the scapulae. The tension applied was only sufficient to insure complete contact with the skin. Record was made of the median value during normal respiration.

Circumference of Arm: The instrument employed in securing this and the three succeeding limb girths was the steel millimeter tape. As with thoracic circumference, the tape was applied to make contact all around and yet avoid compression of the tissues. All observations were taken on the left extremities of the body.

Arm circumference was measured near the middle of the humerus, at the level of the greatest girth over the biceps muscle and below the insertion of the deltoid muscle. The plane of the tape was at right angles to the line of the humerus. During measurement the subject assumed the erect position with the upper extremities hanging near the sides of the body (slightly abducted) in a relaxed condition.

Circumference of Forearm: The position of the limb was the same as for the previous measurement, and identical technique was used except that the observation was taken at the level of the greatest girth below the elbow joint and in the

region of the radiale. Care was taken to see that the musculature of the forearm and hand was relaxed.

Circumference of Thigh: The subject stood with his feet spread about 9 inches apart and his weight equally distributed on both lower extremities. The tape was passed around the thigh at right angles to its long axis and the measurement made at a level just below the gluteal sulcus.

Circumference of Leg: The subject maintained his position as for the previous measurement and the maximum girth of the calf at right angles to its long axis was determined.

Thickness of Skin and Subcutaneous Tissue at Thorax Back: This measurement, together with the two measurements which remain to be described, was taken with so-called "fat" calipers devised by the American Child Health Association. In all three instances the flat, blunt-nosed branches of the calipers were held parallel to the long axis of the body or extremity of the subject.

In taking the measurement at the rear of the thorax, the anthropometrist placed the thumb and first finger of his left hand about 40 millimeters apart over the region below and slightly lateral to the inferior angle of the left scapula and in the transverse plane of the xiphoid cartilage. He then moved these digits directly toward each other, taking care that they did not tend away from the thorax. The instrument was next applied to the tissue held between his thumb and finger and the measurement read off. The objective was to measure the thickness of a complete double layer of skin and subcutaneous tissue without including any muscle tissue.

Thickness of Skin and Subcutaneous Tissue at Arm Back: This measurement was taken over the triceps muscle at approximately the mid-point of the shaft of the left humerus with the arm hanging in a relaxed condition. The technique was the same as for the previous measurement.

Thickness of Skin and Subcutaneous Tissue above Iliac Crest: The calipers were applied immediately superior to the crest of the left ilium in a line vertical with the left axilla. The size of the bite taken between the digits of the anthropometrist varied with the amount of subcutaneous tissue of the individual subject.

All measurements were made on the nude subject and recorded to the nearest millimeter.

SUBJECTS

The subjects were twenty-five Iowa City boys enrolled in the third and fourth grades of the University of Iowa Elementary school during the year 1935-1936. Each boy was scheduled to serve as a subject for the study seven successive times, once every four weeks beginning November 13 or 14 and ending April 29 or 30. Occasional absences reduced the total number of examinations made to 163. The youngest boy in the group was seven years, eight months at the time the first ex-

amination was made, and the oldest boy was ten years, three months by the time of the final examination.

The principal reason for accumulating the data on twenty-five individuals rather than on 163 different individuals lay in the fact that this smaller group was already under observation in connection with a serial growth study. In addition to being conveniently available, however, the sample was found to represent considerable dispersion in body size and build. The eight-year-old boys ranged between 128.0 cm. and 143.9 cm. for stature, between 57.2 cm. and 66.6 cm. for thoracic circumference, and between 35.4 cm. and 43.5 cm. for girth of thigh. The shortest boy had the largest thigh circumference and the tallest boy the second smallest girth of thorax. Similar deviation characterized the nine-year-olds. Stature ranged from 132.6 cm. to 152.7 cm., bi-iliac diameter from 19.9 cm. to 24.1 cm., and arm girth from 17.4 cm. to 23.1 cm. The tallest boy had the largest bi-iliac diameter while the shortest had the largest circumference of arm.

EXAMINATION PROCEDURE

The procedure at each examination was as follows:

1. The subject removed all clothing.

2. The anthropometrist made observations for each of the fifteen measurements being investigated and serially called off the observed values to a recorder. Usually the order of measurement was, first, sliding caliper dimensions, secondly, tape dimensions, thirdly, measurements of skin and subcutaneous tissue, and finally, measurement of stature and sitting height.

3. The anthropometrist left the examination room for a period of approximately ten minutes. During this time the child was serving as a subject in another experiment.

4. On returning to the room, the anthropometrist took a second series of measurement observations for the same fifteen physical dimensions.

It will be noted that the number of dimensions studied, the order of measurement, and the time interval between initial and second measurement all operated in the direction of minimizing the factor of memory on the part of the anthropometrist.

Throughout the entire period of the collection of the data, the measurements were made by the writer and recorded by Dr. Newell C. Kephart. On all occasions extraordinary care was taken to measure each dimension as accurately as possible and to avoid errors of recording.

RELIABILITY FINDINGS

As has been implied in the foregoing discussion, the data consist of 163 pairs of observations (a pair of observations being composed of an initial measurement and a remeasurement after an interim of ten minutes) for each of fifteen anthro-

pometric dimensions. These data were analyzed by (1) obtaining the difference, without regard to sign, between each pair of observations and (2) constructing a reliability table based upon the fifteen series of difference values.

The results of the analysis are given in Table 1. Selected findings revealed by this table are:

1. Bi-condylar diameter of the femur was measured with less absolute error than any of the other fourteen dimensions studied. In contrast, the measurement made with the least consistency from one reading to another was bi-acromial diameter.

2. Other highly reliable dimensions which closely approximated bi-condylar diameter of femur were bi-iliac diameter, bi-condylar diameter of humerus, and the three measurements of skin and subcutaneous tissue. Next to bi-acromial diameter, thoracic circumference was the dimension of lowest absolute reliability.

3. Stature was more accurately determined than either sitting height or circumference of thigh.

4. The absolute measurement errors were greater for bi-trochanteric diameter than for bi-iliac diameter.

5. Of the four girths of the extremities, leg girth was measured with the greatest consistency.

Findings supplementary to the above were sought (1) by expressing the median and maximum values from Table 1 in relation to the actual size of the dimension to which each applied, and (2) by calculating the coefficient of reliability for each of the fifteen dimensions. Table 2 gives the obtained results. The reliability coefficients were calculated, as is customary, by the Pearson product-moment method of correlation. Means of absolute magnitude for the various dimensions, specific for boys nine years of age, were available in studies by Meredith (2) and by Meredith and Boynton (3).

Table 2 shows:

1. The reliability medians given in Table 1, when referred to the mean magnitude of their respective dimensions, equal less than one-fifth of 1 per cent for stature and bi-iliac diameter; less than one-half of 1 per cent for leg girth, bi-trochanteric diameter, bi-condylar diameter of femur, sitting height, thoracic circumference, and girths of forearm and arm; approximately 1 per cent for girth of thigh, bi-condylar diameter of humerus, and bi-acromial diameter; and roughly 4 per cent for the three measurements of skin and subcutaneous tissue.

2. The maximum measurement differences given in Table 1 range from less than 1 per cent of the mean size of their corresponding dimensions to upwards of 20 per cent. The percentage is lowest for stature; between 1 and 4 for measurements of hip width, limb girth, and thoracic circumference; around eight for bi-acromial diameter; and above twenty for the measurements of skin and subcutaneous tissue.

TABLE I

Reliability Constants for Fifteen Anthropometric Dimensions: Each Series of Constants Was Derived from Values Representing the Difference Between Two Measurements Taken in Succession on the Same Subject

Difference Interval (mm.)	Stature		Sitting Height		Thoracic Circumference		Bi-acromial Diameter	
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent
0 to 1	69	42.3	54	33.1	71	43.6	46	28.2
2 to 5	66	40.5	75	46.0	53	32.5	64	39.3
6 to 10	26	16.0	26	17.2	28	17.2	38	23.3
11 to 15	2	1.2	6	3.7	9	5.5	9	5.5
16 to 25					2	1.2	6	3.7
	163	100.0	163	100.0	163	100.0	163	100.0
Median		2.0		2.7		2.4		3.5
90th Percentile		7.5		7.8		9.1		10.3
Maximum		12.		15.		20.		24.
Difference Interval (mm.)	Arm Girth		Forearm Girth		Thigh Girth		Leg Girth	
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent
0 to 1	104	63.8	113	69.3	42	25.8	119	73.0
2 to 5	56	34.4	47	28.8	82	50.3	44	27.0
6 to 10	3	1.8	3	1.8	35	21.4		
11 to 15					4	2.5		
	163	100.0	163	99.9	163	100.0	163	100.0
Median		.9		.8		3.2		.8
90th Percentile		3.9		3.2		7.8		2.6
Maximum		7.		7.		12.		5.
Difference Interval (mm.)	Bi-trochanteric Diameter		Bi-iliac Diameter		Breadth of Elbow		Breadth of Knee	
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent
0	65	39.9	95	58.3	77	47.2	103	63.2
1	52	31.9	51	31.3	66	40.5	53	32.5
2	16	9.8	15	9.2	20	12.3	7	4.3
3	17	10.4	2	1.2				
4 to 7	13	8.0						
	163	100.0	163	100.0	163	100.0	163	100.0
Median		.8		.4		.6		.3
90th Percentile		3.3		1.5		1.7		1.3
Maximum		7.		3.		2.		2.

Thickness of Skin and Subcutaneous Tissue:

Difference Interval (mm.)	At Arm Back		At Thorax Back		Above Iliac Crest	
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent
0*	72	44.2	100	61.3	38	54.0
1*	77	47.2	58	35.6	57	34.9
2*	11	6.8	3	1.8	11	6.8
3 and 4*	3	1.8	2	1.2	7	4.3
	163	100.0	163	99.9	163	100.0
Median		.6		.3		.4
90th Percentile		1.5		1.3		1.7
Maximum		3.		3.		4.

*This series of differences is for the actual measurement of a double layer of tissue. One-half the values given would afford an estimate of the errors of measurement for a single layer.

TABLE 2

Reliability Findings Supplementary to Those Given in Table 1

Dimension	Median from Table 1 x 100	Maximum from Table 1 x 100	Reliability
	Mean Size of Dimension	Mean Size of Dimension	Coefficient
Stature	.15	.90	.993
Bi-iliac diameter	.19	1.40	.994
Girth of leg	.30	1.86	.991
Bi-trochanteric diameter	.35	3.02	.982
Bi-condylar diameter of femur	.36	2.42	.972
Sitting height	.38	2.10	.974
Thoracic circumference	.38	3.21	.977
Forearm girth	.42	3.63	.972
Girth of arm	.47	3.63	.986
Thigh girth	.81	3.04	.978
Bi-condylar diameter of humerus	1.09	3.65	.935
Bi-acromial diameter	1.20	8.22	.819
Thickness of skin and subcutaneous tissue:			
At thorax back	3.66	36.59	.941
Above iliac crest	4.02	40.16	.940
At arm back	4.69	21.74	.948

3. The coefficients of reliability range from .32 to .99, being highest for bi-iliac diameter and stature and lowest for bi-condylar diameter of humerus and bi-acromial diameter.

FINDINGS FOR RELIABILITY IN RELATION TO RATE OF GROWTH

In a paper published in 1930, Lincoln (1) pointed out that in the interpretation of the significance of anthropometric reliability constants it is important to consider their relationship to increments of growth. Backing his discussion with some illustrative material, he wrote:

"....Children 10, 11, and 12 years old are growing at the rate of about 5 cm. a year in standing height, for example. An error of one centimeter is less than 1% of the actual height of the child, but it is 20% of the increment of growth. If an error of this size is made in opposite directions in two successive years.... then the error in the increment becomes 40%.

"The same situation exists for traits other than standing height, except that in some cases the error is proportionally much greater. The iliac diameter of children from 10 to 12 years

old is growing at the rate of only about one centimeter a year. Thus an error of only half a centimeter will in many cases be an error as great as the individual's yearly increment." (1, p. 449-450)

Since this relationship between reliability and growth increment was not developed in Lincoln's paper beyond the general statement just quoted, it appeared pertinent that the present investigation include a specific study of the question. Increment values for the various measurements were obtained from research reports by Meredith (2) and by Meredith and Boynton (3). These values gave the mean gains for eight- and nine-year-old boys in millimeters per year. The ninetieth percentiles given in Table 1 were adopted as reliability thresholds for the respective measurements. In the adoption of these percentiles as the criterion reliability values, the assumption was made that seriatim observations are only profitably made at such intervals as the mean increment of growth equals or exceeds 90 per cent of the reliability differences.

Findings on the relationship, specific for eight- and nine-year-old boys, are shown in Table 3. The first three columns of the table give, in turn, the series of dimensions under consideration, the annual rate of mean growth in each dimension, and, the ninetieth percentiles of reliability distributions for each dimension. A fourth column furnishes an estimate of the maximum time frequency at which seriatim observations for the purpose of studying the growth of the individual appear practically useful.

It will be noted that Table 3 does not include the three measurements of skin and subcutaneous tissue. The reason for this lies in certain tentative indications that growth trends for these measurements are of an undulating or multicyclic form. Obviously, to the extent that subcutaneous tissue registers the nutritional fluctuations of the individual from week to week or month to month, the mean gain or loss for this tissue in annual terms becomes inadequate for determining the frequency at which measurements are profitably made.

SUMMARY AND CONCLUSIONS

Reliability tables, specific for boys eight and nine years old, are presented for each of fifteen anthropometric dimensions. These tables were derived from pairs of measurement observations taken under unusually favorable conditions. Without exception the measurements were made by one anthropometrist. Numerous findings are drawn from the tables. For example, iliac diameter is found to be a more reliable measurement of hip width than bi-trochanteric diameter.

Reliability constants are selected to represent given body dimensions, and each constant is referred to the annual rate of growth for the dimension. In this manner estimates are obtained of the maximum frequency at which seriatim observations for the various dimensions are profitably made. It is found that while some dimensions are taken to advantage at bi-monthly or quarterly intervals, others appear to make no significant contribution to individual growth trends at intervals of less than one year. This finding is considered to have unequivocal implications for the planning and execution of seriatim growth studies. Certainly

TABLE 3

Relationship Between Anthropometric Reliabilities and Growth
Increments for Eight- and Nine-Year-Old Boys

Dimension	Mean Annual Increment (mm.)	Reliability Criterion (mm.)	Estimated Maximum Frequency of Measurement*
Stature	54	7.5	Bimonthly
Bi-iliac diameter	8	1.5	Quarterly
Girth of leg	10	2.6	Quarterly
Bi-trochanteric diameter	10	3.3	Quarterly (?)
Sitting height	21	7.8	Semiannually
Thoracic circum- ference	22	9.1	Semiannually
Girth of thigh	16	7.8	Semiannually
Forearm girth	6	3.2	Semiannually
Arm girth	7	3.9	Semiannually (?)
Bi-condylar diam- eter of femur	2	1.3	Annually
Bi-acromial diam- eter	10	10.3	Annually
Bi-condylar diam- eter of humerus	1	1.7	Biannually

*Some investigators may regard these estimates as too stringent and, alternatively, favor the method of obtaining measurements at one-half the time frequencies given and smoothing the individual curves derived therefrom. The writer is not opposed to this procedure except as it results in a program where frequency of measurement tends to function as a substitute for precision of measurement.

the procedure of taking a constant battery of measurements at every examination is indicated to be untenable.

Succinctly, this paper furnished quantitative evidence leading to the conclusion that efficient and economical research on the physical growth of the individual child lies (1) in a differential approach to anthropometric dimensions and (2) in employment of unusually rigorous measurement technique.

REFERENCES

- (1) Lincoln, Edward A.: The reliability of anthropometric measurements. *Ped. Sem. & J. Genet. Psychol.*, 1930, 38, 445-450.
- (2) Meredith, Howard V.: The rhythm of physical growth: A study of eighteen anthropometric measurements on Iowa City white males ranging in age between

birth and eighteen years, Univ. Iowa Stud., Stud. in Child Welfare, 1935, 11, No. 3, Pp. 128.

- (3) Meredith, Howard V., and Boynton, Bernice: The transverse growth of the extremities: An analysis of girth measurements for arm, forearm, thigh, and leg taken on Iowa City white children. Submitted for publication to *Biometrika*.

CARE OF PRIMARY TEETH

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The term "primary" or "temporary" teeth as the deciduous dentures are frequently called, seems to carry with it a subtle but dangerous suggestion that prophylactic care of a child's teeth does not require the same consideration and skill in treatment as that given to the permanent ones. The persistent retention of this false idea in the minds of a majority of people is undoubtedly accountable for much early dental neglect that becomes a contributing cause of many childhood afflictions.

Structural defects of the primary teeth are comparatively rare when they erupt, but regardless of this initial protection by Nature, the chances are 90 to 1 that the child nourished on the average American family diet, and who has not been accorded the benefit of supervised prophylactic care will become the host to some form of dental disease before he reaches the age of four years.

Providing there are no structural defects in the enamel surfaces of the primary teeth when they erupt, and that the child's diet is sufficiently adequate to meet all physical requirements, professional dental services may be limited to instructions in the home care of the teeth. It is the mother's or nurse's duty to give personal care to the child's teeth until he has reached an age when he can be trained and depended upon to properly use a toothbrush and to thoroughly rinse his mouth.

As a cleansing agent, cold water is amply sufficient. When the teeth are properly brushed, there is little need for anything more than pure cold water and the vigorous use of a good toothbrush. Should stains appear upon the teeth that cannot be removed with the brush and cold water, it then becomes necessary to use a fine polishing substance to restore the natural luster of tooth enamel. Coarse abrasive substances such as powdered pumice stone should never be used. They scratch the enamel and readily invite another accumulation of stain. From the time of the eruption of the first tooth, this home care should be supplemented by professional dental inspection at regularly appointed times in accordance with case requirements.

Dental caries has its inception externally; never from within the tooth. If caries of the primary teeth is to be prevented, the child's mouth must be kept clean and absolutely free from all food remnants, particularly those of the sugar and starch kind. Ever present organisms of the mouth act upon starches and sugar, forming lactic acid by fermentation processes. The lactic acid thus produced acts directly upon the crystal-like rods composing the tooth enamel and establishes the onset of dental caries.

Caries, once formed in the enamel, becomes a serious matter if allowed to penetrate to the dentin. Unchecked, the micro-organisms make rapid inroads through

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the dental tubuli and readily infect the internal vascular tissues - the pulp. The usual termination of such a pathological process is the forming of an alveolar abscess. Aside from the involvement of deeper seated structures, there is a partial or total loss of the tooth.

It is not claimed as yet that dental caries can be entirely prevented in the teeth of every child, but through a comparison of school records and mouth examinations the fact has been established that for the child who has been accorded the advantages of a wholesome diet, regular hours of exercise out in the open sunshine, undisturbed rest periods, and, after each meal and before retiring, such a thorough cleansing of the teeth that all decomposing starchy food is removed, decay of the primary teeth can be practically eliminated.

THE PREMATURE LOSS OF PRIMARY TEETH

The effect of the premature loss of a certain primary tooth, or even a series of losses, by one particular child differs widely from the effect of the same loss in the case of another child of the same age or state of dentition.

A few exceptional cases are usually found in a large group of mouth examinations; and the re-examination of these exceptional cases demonstrates the outstanding persistence of certain intrinsic factors which make for normal growth and development in spite of serious obstacles. Despite these exceptional instances of normal dentition after the premature loss of one or more primary teeth, it by no means follows that such loss is a matter of small importance, or one calling for less than the best professional skill and judgment. The fact remains unquestionable that bone growth and muscular force cannot be as evenly developed nor in so symmetrical a form as in the case of the child who sustains no such losses.

In the cases of children endowed with a robust physique, a normal relationship of the dental arches, and possessed of normal respiration, the loss of one or even two maxillary primary incisors at the age of two and a half years does not necessarily produce a marked effect upon dental arch formation and growth if function of the primary molars and canines remains unimpaired. The maintenance of function of the primary molars, canines, and first permanent molars seems to be of greatest importance in promoting normal arch growth. Except in a special case, such as that of a child who exhibits difficulty in speaking and is in danger of acquiring an undesirable speech habit, or one who takes part in professional theatrical productions and therefore must appear without a physical blemish, there is no justifiable reason for attempting the artificial replacement of prematurely lost maxillary primary incisors. This conclusion, however, is not equally justified in regard to the premature loss of one or more mandibular primary incisors, but even here the child of robust physique, normal dental arch relationship and unimpaired primary molars and canines, may suffer no serious dental disability. Should there be a variation from normal dental arch relationship or an inherent or acquired physical deficiency, then a mechanical support, if properly designed, may be indicated and serve to intercept malocclusion.

Dental caries, accidents, or ill-advised extractions are by no means the only

causes leading to the premature loss of primary teeth. Reasons for the onset of conditions tending to such untimely losses are still in question as they usually occur in the mouths of healthy and well growing children, and seem to follow as the result of advanced development of the permanent teeth, usually observed to be the premolars, lateral incisors and first permanent molars. These teeth, encroaching upon the roots of primary teeth, start an early absorption, particularly in those cases where the primary incisors stand close together. Under such circumstances, the primary canine loosens and, without warning or discomfort, is suddenly cast off. The space closes, thus affecting dental arch growth so seriously that insufficient space is afforded for the eruption and proper alignment of the permanent canine.

While the child may lose only one primary canine from such a cause, this deviation of dentition may occur in the four canine areas at approximately the same time, and such wide deviation would indicate that there must be an over-activity of unknown factors that govern the transition period from primary to permanent dentition.

Much credit is due Samuel J. Lewis for his pioneer research work in connection with this particular anomaly of primary and permanent dentition, and for his introduction of a term that he uses in describing it - "Ectopic Eruption of Permanent Teeth".

MALOCCLUSION OF THE PRIMARY TEETH

The biological reasoning of recognized physiologists, anatomists, embryologists, and anthropologists who lay no claim to orthodontic knowledge is that function is one of the determining factors in all growth processes. They do not discourage the orthodontist's efforts in attempting to correct abnormal tendencies that interfere with functional activities natural to body structure.

The biological principles of growth processes that have been recognized by these scientists are essential in a rational study of malocclusion and dental arch malformation in the young child. Through the early recognition of such anomalies, the primary causes can be studied while still active and before they become obscure through advanced growth. If there is an existing mechanical interference that in any way prevents a normal functioning of the primary teeth or inhibits the natural urge of dental arch growth, it is imperative that some well formulated plan of action for its correction should be taken. When properly constructed and skillfully applied, the delicate mechanism for such corrective treatment should not be the cause of discomfort to a child, and the results that may be obtained in the course of a few weeks or even days will, in many cases, be productive of more actual benefit to the child than years of corrective treatment at a later time in childhood or early youth.

THE EFFECT OF VARYING VERBAL INSTRUCTIONS ON THE MOTOR RESPONSES
OF PRESCHOOL CHILDREN

SUE COOK McCLURE¹

Among the more fundamental concepts introduced by the progressive school is the principle that activities are to be child-initiated rather than teacher-initiated, and that freedom of the child to carry out his own ideas is to be encouraged, rather than obedience to the adult's ideas exacted. Since, however, the child must sometimes be guided by parents or teacher into routine activities or even into activities that are distasteful to him, the problem of direction remains an important one wherever the older methods of punishment and coercion have been rejected.

As attempted solutions of this problem, a number of principles and techniques have been proffered and widely accepted. Among these are such familiar rules as: never use commands when suggestion is possible; always use positive in preference to negative commands; encourage and praise rather than discourage and criticize. Psychometrists, especially, faced with the problem of establishing rapport in the giving of mental tests, have seized on this last rule.

Concerning these principles of child management through the use of language the question inevitably arises: To what extent are they justified in fact? Does the child actually respond better to suggestion than to commands, better to positive than to negative commands, and better to praise than to criticism? This experiment was devised to provide a partial answer to such questions.

Practical recommendations, of which the following are typical, have been given by writers in the field of child training or education. Abbott (1), writing at a time when absolute obedience was the desideratum, advocated using careful thought in giving commands, and allowing children the greatest freedom possible. Of modern writers, Elatz and Bott (3) maintain that commands are unnecessary if the child is guided into activity he likes, rather than subjected to negative commands and destructive criticism. Foster and Headley (8) emphasize the superiority of suggestion over command; and Thom (16) points out that commands stimulate the development of negative traits, whereas suggestion encourages persistence, curiosity, and initiative. Where commands are unavoidable, they should be clear and simple, given with reasons if possible, positive rather than negative, and consistently enforced in a take-it-for-granted manner. Faegre and Anderson (7) make similar recommendations and stress the greater effectiveness of praise than of blame. Poffenberger (14) maintains that the tendency to react positively to suggestion is stronger in younger than in older children.

Early studies on the influence of varying verbal instruction were concerned with the relative effectiveness of praise and reproof. Gilchrist (10) gave the Curtis English Test to two groups of psychology students, one of which was praised, the other reproved for poor performance, before taking the test a second

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time. He found that the praised group improved much more than the other. However, the fact that his groups were neither equal in size nor paired as to initial score may be a factor of importance in determining the trend of results. Gates and Rissland (9), who likewise failed to control the factor of initial ability, found only small differences in improvement on the three-hole and color naming tests among three groups of Barnard College students, one of which was praised, one blamed, and one given the test a second time without comment. Some comment proved somewhat more effective than mere repetition.

Briggs (4) in a study similar to Gilchrist's found that 87 per cent of junior high school pupils made better scores after commendation and encouragement than after reprimands and threats of punishment. Hurlock (11, 12) found that grade school children gained over six points in I.Q. when some comment, whether favorable or adverse, was made in a retest, but that they gained only one point or less when no comment was made. Similarly Chase (6), in a study of children's performances on the Motivation-Dynamometer and Perforation tests which she devised, reports that some motivation is more effective than none, but that failure accompanied by reproof is probably a more effective incentive than success accompanied by praise. Anderson and Smith (2) later repeated the Chase study, using 102 of the same subjects, and reported substantially the same results.

Waring (17) found language approval superior to non-language approval in facilitating simple discriminative processes among preschool children; and Wylie (18) found that 74 per cent of young children responded with obstinate behavior to negative commands, but not to positive commands.

Johnson (13) has investigated the influence upon behavior of different types of command and of positive and negative suggestion. Seventy-four children from the University Elementary School at the University of Michigan, ranging from two and a half to seven years old, were divided into a control and an experimental group and observed in 70 experimental situations. The six situations described in Johnson's published article were designed to measure the child's obedience to instructions and his persistence in several tasks when given specific or general commands, positive or negative commands, encouragement or discouragement, positive suggestion or a question, and hurrying or unhurrying commands. The author reports differences divided by their probable errors ranging from 1.02 to 25.80 in favor of the experimental group, with three of the six ratios exceeding 3.00. No age differences were found. She concludes that positive, unhurrying, specific, and encouraging types of instruction are more effective than negative, hurrying, general, and discouraging types.

Analysis of the literature shows, therefore, that whereas all the writings on practical child training consider praise and encouragement superior to blame and discouragement, there is considerable disagreement in the experimental studies as to the relative effectiveness of the two methods.

METHOD

Subjects. The subjects of this experiment were 22 children from the nursery school and 16 from the kindergarten of the Institute of Child Welfare of the Uni-

versity of Minnesota, 23 nursery school children from the Pillsbury Settlement House, and 16 kindergarten children from the Northeast Neighborhood House, Minneapolis. Settlement house children were included not only to increase the total number of subjects but also to make possible a study of the effect of familiarity with the experimenter on the children's behavior. Of the 77 subjects, 45 were nursery school children between 27 and 59 months old, with a mean age of 43.93 months, and 32 were kindergarten children ranging from 52 to 70 months, with a mean age of 59.28 months. Twenty nursery school subjects were boys, 25 were girls; 19 kindergarten subjects were boys, 13 were girls.

The subjects at the Institute of Child Welfare were given two forms of the experiment; the Pillsbury nursery school subjects, only Form I; and the Northeast Kindergarten subjects, only Form II. Of the 115 records, 44 were for Institute nursery school children, 32 for Institute kindergartners; 16 were for Northeast kindergarten subjects; and 23 for the Pillsbury subjects.

Place and equipment. The children were tested in their respective schools and kindergartens. The rooms used were in all cases set apart from the rest of the school and were alike in all essential respects. The materials used, all of which were kept in an appointed place, included the following: toy banks in the shape of houses; small colored pegs, some in a box, others scattered on the floor; stack of buff-colored drawing paper, row of five crayons; blunt scissors, sheet of orange paper containing drawings of a ball and a feather, printed university catalogues scattered on the floor. The arrangement of the materials varied somewhat between the two forms of the experiment, because of the different order in which the situations were presented. In addition to stop-watch, record blank, and conversation sheet, the experimenter had a child's drawing of a man, which was kept concealed until instruction 8A was given. The record sheet provided spaces for separate recording of responses to the theoretically superior (type A) and inferior (type B) instructions. In all cases the criterion for positiveness of response was motor rather than verbal, although space was provided for the child's and the experimenter's comments. Routine information as to the child's name and history was recorded at the top of the sheet.

Time. The data were gathered between February 3 and April 30, 1936. In all cases, records were made between 8:30 and 11:30 A.M. or between 2:30 and 3:30 P.M. The obtaining of individual records required from 15 to 30 minutes.

Instructions given. The instructions consisted of 15 pairs of verbal directions. With a few slight variations which are indicated in the list below, these were the same on the two forms of the test. A predetermined order, different for the two forms, was followed in presenting the several situations. Of the pair of instructions, A and B, given in each situation, the A series were theoretically preferable; that is, in keeping with the theories that suggestion is more effective than command, positive suggestion more effective than negative, etc. In giving Form I, the A form of instruction was given first in situations 1, 2, 3, 8, 10, 12; the B form first in situations 4, 5, 6, 7, 9, 11, 13, 14, 15; in giving Form II, the B type was given first in situations 1, 2, 3, 4, 5, 6, 7, 9, 11, 15, in order to control the factor of order or presentation. By breaking up the situations into two parts (telling the child that he might take another crayon now,

getting him to draw a second object, or guiding him back to a slightly different form of the same situation), each child's reaction to both the A and B forms of instruction was obtained in all situations except 4, 9, 12, and 15. In these situations, if the child reacted positively to the first form of instruction presented, he was not given the second form. This was made necessary because the method of control used was intra- rather than inter-child. Since young children are extremely sensitive to slight changes in the situation the child's reaction was considered a response to the language stimulus only if it occurred within a specified time, as indicated below. The time the child required to complete a task, or the time he persisted in his efforts, was recorded for situations 3, 11, 13, and 14. The situations and the forms of instruction used were as follows:

1. Request vs. command.

Child asked to pick up pegs (Form I) or books (Form II).

- A. "I wonder if you will help me."
- B. "Get to work!"

2. Specific vs. general command.

Continuation of situation 1.

- A. "Pick up all the pegs (books) and put them in the box on the table." (Pointing).
- B. "Put the pegs (books) away."

3. Unhurrying vs. hurrying instructions.

Continuation of situation 1. (Time record of performance).

- A. "You can do it if you begin not."
- B. "Hurry and do it. Hurry up!"

4. Positive vs. negative suggestion.

Child shown paper and crayons. (Time limit 15 seconds).

- A. "You would like to draw something, wouldn't you?"
- B. "You wouldn't like to use them, would you?"

5. Positive suggestion in form of statement of fact vs. positive suggestion in form of question.

Continuation of drawing situation. (Time limit 30 seconds).

- A. "The next thing we are going to draw is a big, red ball."
- B. "Would you like to draw a ball?"

6. Positive vs. negative command.

Continuation of drawing situation. (Time limit 30 seconds).

- A. "Use only the crayon you have in your hand."
- B. "Don't use more than one crayon."

7. Command giving reason vs. command not giving reason.
Continuation of drawing situation. (Time limit 30 seconds).
 - A. "Use only the piece of paper you have now. We must save the rest for the other children."
 - B. "Use only one piece of paper."
8. Appeal to competition vs. command not appealing to competition.
Continuation of drawing situation. (Time limit 30 seconds).
 - A. "Look at the man that _____ drew. Can you draw a man as well as that?"
 - B. "Draw another ball."
9. Positive suggestion in form of statement of fact vs. positive suggestion in form of question.
Child presented with cutting materials. (Time limit 15 seconds).
 - A. "We are going to cut something out now."
 - B. "Do you want to cut something out now?"
10. Emphasis on immediate objectives vs. emphasis on postponed objectives.
Child given choice of cutting out stenciled ball or feather. (Time limit 30 seconds).
 - A. "If you cut the ball (feather) out, you may take it home today."
 - B. "If you cut the feather (ball) out, you may take it home next week."
11. Praise vs. reproof.
Continuation of cutting out ball or feather. (Time record of performance)
 - A. "You are doing fine with that. You'll soon have it cut out. Keep working on it."
 - B. "You are not doing very well with that. You are not taking pains with it. Keep working on it."
12. Suggestion vs. command.
Child told of red balloons (or toy banks with concealed opening) in sack on table. (Time limit 30 seconds).
 - A. "When I was downtown yesterday I saw some pretty red balloons (funny boxes). I brought two (three) home with me. They are in the paper sack on the table by the window."
 - B. "Bring them over here."
13. Encouragement vs. discouragement.
Child tries to blow up balloon (open box). (Time record of performance).
 - A. "Blow (or open) this one up. It is easy. You can do it."

- B. "Can you blow (or open) this one up? It may be too hard."
14. Emphasis on success vs. emphasis on failure.
Continuation of situation 13. (Time record of performance).
- A. "You almost did it that time."
B. "You haven't done it yet."
15. Positive suggestion in form of statement of fact vs. positive suggestion in form of question.
Child induced to leave scene of experiment. (Time limit 15 seconds).
- A. "We are going downstairs now."
B. "Do you want to go downstairs now?"

Although patterned to a great extent on the Johnson (13) study, the present investigation differs from it in that: (a) intra-child, rather than inter-child control is used; (b) time limits were set within which the positive response must occur; (c) the instructions were given in a continuous conversation rather than in discrete units, and any necessary interpolations so phrased as not to influence the child's response; and (d) two forms of the experiment were given.

RESULTS

Differences were computed between percentages of positive responses made: (1) on the two forms; (2) in response to A and B types of instructions; (3) by subjects familiar and unfamiliar with the examiner; (4) by kindergarten and nursery school subjects; and (5) by boys and girls. In order to determine whether the obtained differences were significant or were simply due to chance fluctuations in the data, each difference was divided by its standard error. When the resulting critical ratios so obtained were greater than 3.0, the differences were regarded as definitely significant. When they were less than 3.0, the differences were regarded as only probably significant.

Differences between forms. Table I presents the percentages, and critical ratios of the difference between percentages, of positive reactions to each instruction on Form I and Form II. In only four cases - 1B, 2B, 10A and 10B, do the ratios exceed 3.00; for items 4A, 7A, 8A, and 13A, they are between 2.03 and 2.35. Most of the other difference ratios are low. Inasmuch as the two forms of the test are virtually identical except for order of presentation, and since 38 of the same subjects took both forms, this finding is, of course, not unexpected.

Differences between A (theoretically superior) and B (theoretically inferior) types of instruction. On Form I, critical ratios in excess of 3.00 between A and B types of instruction were found in all situations except 4, 6, and 11. (See Table III). Differences were in favor of the A type of instruction except in situations 4, 8, 9, 11, and 15. On Form II, differences were significant in situations 4, 8, 9, 12, 13, 14, and 15. In situations 4, 8, 9, and 15, the differences favored the B type of instruction; in situations 12, 13, and 14 the differences favored the A type.

TABLE 1

DIFFERENCES BETWEEN FORMS I AND II IN
POSITIVE RESPONSES TO INDIVIDUAL INSTRUCTIONS

Situation	Percentage of Positive Responses		Diff.*
	Form I(N=61)	Form II (N=54)	S.D. Diff.
Type A (Theoretically Superior) Instructions			
1	96.7	92.5	0.99
2	96.7	92.5	0.99
3	67.2	51.9	1.69
4	45.9	27.8	2.03
5	73.7	74.1	0.51
6	68.9	68.5	0.05
7	96.7	83.4	2.35
8	18.0	35.2	<u>2.09</u>
9	14.8	9.3	0.91
10	83.6	44.5	0.47
11	39.3	44.5	<u>0.57</u>
12	75.4	81.5	<u>0.80</u>
13	67.2	46.4	2.27
14	73.8	87.0	<u>1.83</u>
15	24.6	33.3	<u>1.02</u>
Type B (Theoretically Inferior) Instructions			
1	73.8	94.5	<u>3.25</u>
2	68.9	94.5	<u>3.90</u>
3	27.9	44.5	<u>1.85</u>
4	47.5	64.8	<u>1.39</u>
5	41.0	57.4	<u>1.78</u>
6	54.1	50.0	0.44
7	72.1	79.6	<u>0.94</u>
8	65.6	70.4	<u>0.56</u>
9	77.0	88.9	<u>1.72</u>
10	13.1	50.0	<u>4.58</u>
11	44.3	40.8	0.38
12	21.3	18.5	0.38
13	19.7	7.4	0.99
14	18.0	13.0	0.74
15	59.0	66.6	<u>0.85</u>

*Underlined figures indicate that the difference favored Form II.

TABLE 2

INFERENCES BETWEEN TYPE A (THEORETICALLY SUPERIOR) AND TYPE B (THEORETICALLY INFERIOR) INSTRUCTIONS ON FORMS I AND II AND ON THE TWO FORMS COMBINED.

Situation	Percentage of Positive Responses		Diff.*
	Type A	Type B	S.D. Diff.
<u>Form I</u>			
1	96.7	73.8	3.73
2	96.7	68.9	4.34
3	67.2	27.9	4.71
4	45.9	47.5	<u>0.18</u>
5	73.7	41.0	4.63
6	68.9	54.1	1.70
7	96.7	72.1	4.00
8	18.0	65.6	<u>6.04</u>
9	14.6	77.0	<u>9.76</u>
10	83.6	13.1	11.07
11	39.3	44.3	<u>0.56</u>
12	75.4	21.3	6.95
13	67.2	19.7	5.98
14	73.8	18.0	7.50
15	24.6	59.0	<u>4.08</u>
<u>Form II</u>			
1	92.5	94.5	<u>0.43</u>
2	92.5	94.5	<u>0.43</u>
3	51.9	44.5	0.77
4	27.8	64.8	<u>4.15</u>
5	74.1	57.4	1.85
6	68.5	50.0	1.99
7	83.4	79.6	0.52
8	35.2	70.4	<u>3.92</u>
9	9.3	88.9	<u>13.72</u>
10	44.5	50.0	<u>0.58</u>
11	44.5	40.8	0.39
12	81.5	18.5	8.43
13	46.4	7.4	5.09
14	87.0	13.0	11.39
15	33.3	66.6	<u>3.68</u>
<u>Forms I and II Combined</u>			
1	94.8	83.5	2.86
2	94.8	80.9	3.45
3	60.0	35.7	3.77
4	37.4	55.7	<u>2.86</u>
5	76.5	48.7	4.51
6	68.7	52.2	2.57

TABLE 2 (Continued)

7	90.4	75.7	3.00
8	26.1	67.8	<u>6.93</u>
9	12.2	82.6	<u>15.07</u>
10	65.2	30.4	5.59
11	41.7	42.6	<u>0.14</u>
12	78.3	20.0	<u>10.69</u>
13	57.4	13.9	7.57
14	80.0	15.7	12.46
15	28.7	62.6	<u>5.45</u>

*Underlined figures indicate that the difference favored type B.

When difference ratios between A and B instructions were computed for the two forms combined, significant differences (critical ratios exceeding 3.00) were found in 11 of the 15 cases, and ratios approaching significance in three of the remaining cases. (See Table I). In evaluating these differences, however, it should be remembered that the two forms are reliably different on items 1B, 2B, and 10B. Table II shows that combining Forms I and II produces marked differences in a number of the ratios.

Differences between subjects familiar and unfamiliar with experimenter. No significant differences on individual items were found between Child Welfare subjects (familiar with experimenter) and settlement house subjects (unfamiliar with experimenter). Between Pillsbury subjects and Child Welfare nursery school subjects a critical ratio of 1.63 was found on the total A instructions, Form I; 1.22 on the total B instructions for the same form. On Form II, a critical ratio of .464 was found between Northeast and Child Welfare kindergarten subjects on the total A instructions; a ratio of .553 on the B instructions.

Differences between nursery school and kindergarten children. Because of the small number of children of each age taking each form of the test, critical ratios between the age groups were computed for all A and all B instructions. For the former type, a ratio of .848 was obtained, for the latter, 4.86, both differences favoring the older children. Table III shows the percentages of each age group responding favorably to each instruction.

Sex differences. No statistically significant sex differences were found on either form, though several approached significance. (See Table IV).

DISCUSSION OF RESULTS

Form differences. Differences between forms too great to be due to chance may be explained by (a) differences in order of presentation or (b) change in the type of stimulus material. These children proved significantly more willing to pick up the books in response to a command given at the beginning of the experiment, than they were to pick up the pegs toward the end of the experiment, after having been requested to do so at an earlier stage. Likewise they obeyed a general

TABLE 3

Percentages of Nursery School and of Kindergarten Children Responding Positively to Each Instruction.

Situation	Form I		Form II	
	Nursery School	Kindergarten	Nursery School	Kindergarten
Type A (Theoretically Superior) Instructions				
1	100.0	100.0	86.4	93.9
2	100.0	100.0	86.4	93.9
3	63.6	68.9	40.9	50.0
4	59.1	25.0	22.7	6.3
5	90.9	87.6	68.2	87.6
6	81.8	75.1	50.0	87.6
7	90.9	100.0	77.3	93.9
8	9.1	50.0	13.6	68.9
9	27.3	12.5	18.2	6.3
10	77.3	81.4	40.9	50.0
11	27.3	62.5	54.5	43.8
12	72.7	93.9	86.4	87.6
13	63.6	87.6	68.2	25.0
14	63.6	75.1	95.5	81.4
15	36.4	18.8	54.5	18.8
Type B (Theoretically Inferior) Instructions				
1	77.3	87.6	95.5	93.9
2	59.1	87.6	95.5	93.9
3	36.4	25.0	54.5	43.8
4	36.4	56.3	63.6	87.6
5	22.7	77.6	45.5	68.9
6	36.4	81.4	45.5	62.5
7	50.0	87.6	68.2	87.6
8	59.1	81.4	50.0	81.4
9	63.6	81.4	77.3	93.9
10	18.2	18.8	50.0	43.8
11	63.6	37.6	18.2	56.3
12	18.2	12.5	13.6	12.5
13	18.2	18.8	0.0	12.5
14	22.7	18.8	4.5	18.8
15	63.6	81.4	45.5	31.4

command to put the books away better at the beginning of the experiment than later, after they had previously received the specific command. There is some evidence that age differences affected this finding, since the older children tended to respond equally well in situations 1 and 2 regardless of order of presentation, whereas the younger children tended to respond better to the instruction given first, whether it was theoretically superior or inferior. On item 10B

TABLE 4

Sex Differences in Responses to Each Instruction						
Situation	Positive Responses to Type A Instructions			Positive Responses to Type B Instructions		
	Per Cent		Diff.	Per Cent		Diff.
	Boys	Girls	S.D. Diff.*	Boys	Girls	S.D. Diff.*
<u>Form I</u>						
1	100.0	94.1	1.30	70.3	76.5	<u>0.55</u>
2	100.0	94.1	1.30	66.7	70.6	<u>0.33</u>
3	70.3	64.7	0.47	25.9	29.4	<u>0.31</u>
4	55.6	38.2	1.38	29.6	61.8	<u>2.66</u>
5	81.5	76.5	0.48	48.1	35.3	1.01
6	55.6	79.4	<u>2.01</u>	55.6	52.9	0.21
7	92.6	100.0	<u>1.43</u>	59.3	82.4	<u>2.00</u>
8	14.8	20.6	<u>0.59</u>	55.6	73.5	<u>1.47</u>
9	14.8	14.7	0.01	77.8	76.5	0.12
10	85.1	82.4	0.28	7.4	17.6	<u>1.24</u>
11	40.7	38.2	0.20	44.4	44.1	0.02
12	77.8	73.5	0.39	22.2	20.6	0.02
13	66.7	67.6	<u>0.08</u>	22.2	17.6	0.09
14	74.1	73.5	0.05	18.5	17.6	0.09
15	25.9	23.5	0.22	74.1	47.1	2.25
<u>Form II</u>						
1	93.1	92.0	0.15	93.1	96.0	<u>0.45</u>
2	93.1	92.0	0.15	93.1	96.0	<u>0.45</u>
3	65.5	36.0	2.27	31.0	60.0	<u>2.22</u>
4	31.0	24.0	0.58	55.2	76.0	<u>1.66</u>
5	69.0	80.0	<u>0.98</u>	62.1	52.0	0.75
6	62.1	76.0	<u>1.12</u>	37.9	64.0	<u>1.98</u>
7	79.3	88.0	<u>0.87</u>	72.4	88.0	<u>1.48</u>
8	31.0	40.0	<u>0.6</u>	69.0	72.0	<u>0.25</u>
9	10.3	8.0	0.30	82.6	92.0	<u>0.65</u>
10	41.4	48.0	<u>0.48</u>	51.7	48.0	0.27
11	44.8	44.0	0.06	41.4	40.0	0.10
12	82.8	80.0	0.26	17.2	20.0	<u>0.26</u>
13	62.1	28.0	2.68	6.9	8.0	<u>0.15</u>
14	86.2	88.0	<u>0.19</u>	13.8	12.0	0.20
15	24.1	44.0	<u>1.56</u>	75.9	56.0	1.56

*Underlined figures indicate difference in favor of girls.

the greater percentage of positive responses on Form II may be due to the fact that it is easier to cut out a ball than a feather.

Differences between A and B types of instruction. Significant differences

between the A and B types of instruction on items 1, 2, and 3 of Form I indicate that if the superior type is given first, a request for help is more effective than a direct command; a specific direction is more effective than a general one; and unhurrying directions are preferable to hurrying directions. On Form II, however, where the inferior type of instruction was given first, practically the same percentages of positive responses were elicited by the inferior type as were elicited by the superior type, which was given later. When Forms I and II are combined, the large differences on Form I in favor of the superior instructions are sufficient to produce critical ratios in excess of 3.00.

On items 4, 9, and 15 the inferior form of instruction was given first; the superior was given only if the inferior failed to elicit a response. Except on item 4 of Form I, few subjects failed to respond to the inferior instruction. On item 12, where the superior form was given first and the other form only if the child failed to respond, the first instruction again elicited a response from most of the children. Thus, on these items the desirability of the stimulus offered, rather than the form of instruction, appeared to supply the necessary motivation. On item 5, however, where the inferior type ("Would you like to draw a ball?") was given first and the superior ("The next thing we are going to draw is a big, round ball") was given later, the difference ratio of 4.51 (both forms combined) in favor of the latter would seem to be due to the difference in type of instruction.

The fairly high critical ratios on item 6 (above 1.50 in all three cases) indicate that the positive command ("Use only the crayon you have in your hand") is probably though not certainly more effective than the negative command ("Don't use more than one crayon"). On item 7 the difference between a command giving reason and a command not giving reason is reliable on Form I but low (0.52) on Form II. The lower ratio on Form II may be due to the inclusion of 16 more kindergarten subjects in the group taking this form; for, as Table III shows, the older children tend to respond about equally well to the two forms of instruction in this situation. On item 8, on the other hand, the older children are affected more than the younger by the superiority of instruction A, which is an appeal to competition. (See Table III). Since the younger children outnumber the kindergartners 45 to 32, it is probable that the high critical ratios in favor of the theoretically less desirable instruction are due to the age of the subjects.

On Form I and on the two forms combined, significant differences are found on item 10 in favor of the instruction offering immediate reward. On Form II the difference is in the same direction but small. The fact that it is harder for a young child to cut out a feather than a ball probably explains the significant difference between Forms I and II on this item. The coupling of the easier task with the theoretically preferable instruction produced a very high critical ratio (11.07) on Form I.

Standard scores were used in measuring the effects of praise and reproof in situation 11, where the child was timed as he cut out the ball or feather. The small critical ratios indicate that, for the total age range, praise and reproof were about equally effective, though certain age differences were found. (See Table III).

High critical ratios on both forms and on the combined forms were found in situations 13 and 14. These indicate that encouragement is more effective than discouragement and that emphasis on success is more effective than emphasis on failure.

An indication of the reliability of the differences between the A and B types of instruction is the fact that where large critical ratios were found on both forms of the test, the differences were in the same direction.

Differences between subjects familiar and unfamiliar with experimenter. Since no critical ratios in excess of 3.00 were found on any item, it seems reasonable to assume that familiarity or unfamiliarity with the experimenter did not affect the results to any great extent. The experimenter felt that the nature of the child's response was influenced less by the extent to which he was acquainted with her, than by the type of training he was receiving in the nursery school or kindergarten he attended.

Differences between nursery school and kindergarten children. In general, kindergarten children gave more positive responses than younger subjects, both to superior and inferior instructions. On items 4, 9, and 15, where the superior form was given only if the inferior failed, fewer of the older than of the younger children had to be given the second form. Since the number of children of each age taking each form was small, and since the findings were in several instances different on the two forms, generalization concerning individual items is virtually impossible. The relative difficulty of the tasks at the different age levels probably was a factor in some cases, notably in situations 10 and 11 where the child cut out the ball or feather.

Sex differences. Care was taken in planning the experiment to select tasks of equal interest to the two sexes. Since most of the difference ratios were less than 1.00, and only 7 of the 60 ratios on the two forms fell between 2.00 and 3.00 (three were in favor of the boys, four in favor of the girls), it may be assumed that sex did not play an important role in determining responses.

SUMMARY AND CONCLUSIONS

The subjects in this experiment were 39 children from two Minneapolis settlement houses and 36 children from the Institute of Child Welfare of the University of Minnesota. The age range was 27 to 70 months; the mean age for nursery school subjects 43.93 months; for kindergarten subjects 59.28 months. The Institute of Child Welfare subjects were given two forms of the experiment, each settlement house group was given one. On the basis of results found, the following tentative conclusions may be drawn with respect to the age groups studied:

1. Encouragement is more effective than discouragement, and emphasis on success more effective than emphasis on failure at these ages.
2. Ease or difficulty of the task may be more important in determining response than the form of instruction given.

3. Desirability of the task may be more important in determining response than the form of instruction.

4. In a task not intrinsically very desirable (drawing a ball), a statement that the task is to be performed, couched in attractive terms, is more effective than a question as to whether the child wishes to perform the task.

5. The effectiveness of particular types of instruction depends in part on whether the theoretically superior type is presented first or second.

6. In general, older subjects are more likely than younger subjects to respond positively to instructions, whether these are theoretically good or bad.

7. Older children respond more readily than younger to an appeal to competition.

8. Sex does not seem to play an important part in determining the nature of responses to the instructions given.

9. Familiarity and unfamiliarity with the experimenter produce no demonstrable difference in response.

That human behavior is too variable to permit of the formulation of a fixed set of rules for its regulation seems to be indicated by this study. Not only must the personality of the child be taken into consideration, but also the total situation of which he is only a part.

REFERENCES

- (1) Abbott, Jacob. Gentle measures in the management and training of the young. New York: Harper Brothers, 1872.
- (2) Anderson, Harold H., and Smith, Ruth S. Motivation of young children: The constancy of certain behavior patterns. *J. Exper. Educ.*, 1933-34, 2, pp. 138-160.
- (3) Blatz, Wm. E., and Dott, Helen. The management of young children. New York: William Morrow and Company, 1930.
- (4) Briggs, Thomas H. Praise and censure as incentives. *School and Society*, 1927, 26, 596-598.
- (5) Burnham, William H. The normal mind. New York: D. Appleton and Company, 1925.
- (6) Chase, Lucile. Motivation of young children. Iowa Child Welfare Research Station Publication, V, No. 3. Iowa City, University Press, 1932.
- (7) Faegre, Marion L., and Anderson, John E. Child care and training. Minneapolis: The University of Minnesota Press, 1929.
- (8) Foeter, Josephine C., and Headley, Neith. Education in the kindergarten. New York: American Book Company, 1936.
- (9) Gates, Georgina Stickland, and Rissland, Louise G. The effect of encouragement and of discouragement upon performance. *J. Educ. Psychol.* 1923, 14, 21-26.
- (10) Gilchrist, Edward P. The extent to which praise and reproof affect a pupil's

- work. *School and Society*, 1916, 4, 872-874.
- (11) Hurlock, Elizabeth B. The effect of incentives upon the constancy of the I.Q. *Pedagogical Seminary*, 1925, 32, pp. 422-434.
 - (12) Hurlock, Elizabeth B. The value of praise and reproof as incentives for children. *Arch. Psychol.* 1924-25, 11, No. 71, 5-76.
 - (13) Johnson, Marguerite Wilker, The influence of verbal directions on behavior. *Child Development*, 6, 3, 196-205.
 - (14) Poffenberger, A. T. *Applied psychology: Its principles and methods*. New York: D. Appleton and Company, 1929.
 - (15) Terman, Lewis M. *The measurement of intelligence: An explanation of and a complete guide for the use of the Stanford revision and extension of the Binet-Simon intelligence scale*. New York: Houghton Mifflin, 1916.
 - (16) Thom, D. A. *Everyday problems of the everyday child*. New York: D. Appleton and Company, 1929.
 - (17) Waring, Ethel B. *The relation between early language habits and early habits of conduct control*. New York: Bureau of Publications, Columbia Univ. 1927.
 - (18) Wylie, Margaret. Experimental study of negativistic behavior in preschool children. 12th Ann. Rept. *Criminology*, 1930, 89-91.

DEVELOPMENTAL SEQUENCES IN NAME WRITING

GERTRUDE HILDRETH¹

Considerable attention has been paid to the spontaneous drawing activities of young children, but their first writing efforts have all but escaped the notice of child psychologists. The probable reason is that writing, much more than drawing, is considered a subject of school instruction. The concept of writing as a developmental process in preschool age children is comparatively new.

Stern (10), Luquet (6), Legrún (5) and Monroe (7) illustrate and describe the young child's early writing efforts, often apparently the result of the child's spontaneous interest in the process, and have called attention to this spontaneous interest as a developmental sign, paralleling the child's mental maturation progress.

One study (2) showed that feeble-minded subjects under a mental age of eight were unable to write their names. Apparently no comprehensive or systematic study has previously been made of the writing efforts of preschool children in successive age ranges who show early interest in writing and develop some skill in the process.

In the course of examining young children under six years of age we have followed the practice regularly of obtaining drawing and writing samples to test motor control, handedness, comprehension of directions and compliance with requests.

When we found in the course of making comprehensive mental examinations of children between the ages of three and six that many of the children seemed eager to write their names on their drawings, we made the name writing exercise a routine part of all examinations of these children. This preliminary, but informal experiment gave convincing evidence that the child's ability to write his name improved steadily from age three to age six without any direct instruction in writing, and that exceptional maturity or immaturity in name writing, apart from direct instruction, was a significant developmental sign. In order to verify this tentative hypothesis name writing data were collected from children in these age ranges more uniformly and systematically.

THE TEST AND THE SUBJECTS

The subjects consisted of all the children between the ages of three and six and a half enrolled or applying for admission over a period of two years' time in a private school in New York City, where the median I.Q. in all grades has for some years remained approximately constant at 120.

Each child was tested individually, the writing exercise coming at the end of a series of tests and games. The request to write usually followed the opportunity to draw. The younger children were given large crayons and large clean sheets

¹From Lincoln School of Teachers College, New York.

of paper. Older children used kindergarten style pencils and were given sheets with lines ruled about an inch apart. Each child was told to write his name and any letters or numbers he could make. He was given all the time he needed and even though he refused at first was encouraged repeatedly to try. In the case of the youngest children who refused, the examiner placed the crayon or pencil in their hands and placed the hand on the paper. If the child still refused, the examiner insisted, "Just pretend you can write". With this procedure the number of children who refused to make any attempt was reduced to a minimum. Ordinarily the child could produce some result in a very short time. Older children were urged to write both first and last names when there was any indication that they might be able to do so. Children who said they knew several ways to write their name were encouraged to demonstrate all styles. Most of the children over four years and a half responded with alacrity, did not consider the request a hardship, and took pride in their achievement. Probably more children could have written their last names but their patience tended to give out before completing the task. Several children recognized their incapacity to write and one honestly commented, "I'll just pretend I can write my name". Only one child of those examined refused entirely to make any kind of mark at all. This was a girl just four years of age.

The children were never shown how to write by the examiner nor helped in the actual writing process. However, many of the children had observed the examiner taking notes and the younger children frequently tried in imitation of the examiner to make hasty, wavy lines across the page. Several had commented to the examiner, "How fast you can write" or "What are you writing?"

The children who could write recognizable letters almost universally wrote in capital letter style or upper case rather than lower case or cursive style. Only four children of all those examined wrote wholly or in part in some other style than printing, and these children were all over six years of age.

The total number of children examined was 170 divided in the following age ranges: 3-3.5, 11; 3.6 to 3.11, 19; 4.0 to 4.5, 19; 4.6 to 4.11, 28; 5.0 to 5.5, 24; 5.6 to 5.11, 25; 6.0 to 6.5, 23; 6-6 to 6-11, 21. Half of the children were boys, half girls.

After the name writing samples were collected, they were arranged by the writer in order of maturity according to several criteria: legible letters, spacing, spelling, evenness and alignment. When the samples within any age level were arranged in order of excellence, considerable overlapping in the samples of any age group with the next was found. The least mature writers in the group 5.0 to 5.5, for example, were not so mature as the best writers in the age group 4.6 to 4.11. This was true of practically every age group for whom samples were collected.

After the samples were arranged in order, the median quality for each group was found by locating the median paper. This paper together with several other samples that clustered about the median were selected as representative of that particular age group.

RESULTS

By the method just described the samples chosen as representative of the median shown in figures 2 to 8 were obtained. Figure 1 shows a sample of name writing representative of children under three years of age, a sample which may for all practical purposes be considered as representative of the zero level in name writing.

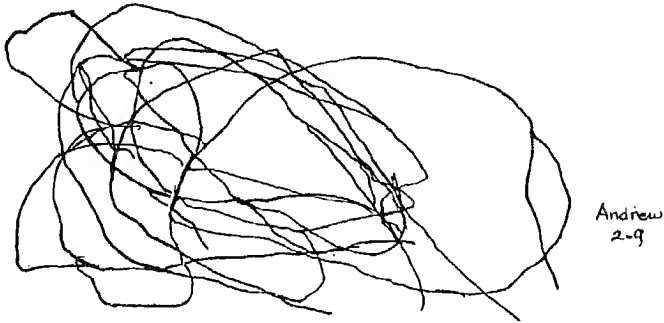


FIGURE 1. NAME WRITING SAMPLE BELOW AGE 3-0

Not all of the improvement shown by the children from age group to age group is indicated in the ratings or in the percentage summary of the data. Improvement was shown in motor control, in ease of adjustment to writing, in willingness to respond, in posture, in use of the writing instrument, in eagerness to write, in pleasure shown in the activity, in speed, ability to write the last name as well as the first without sign of fatigue.

Writing of all the children tested in any age group tended to become more uniform from child to child in the older age groups. Attention span was longer and attention more intense and uniformly maintained in the older age groups. The older children needed less urging, and were more apt to comply with the request to write at the first opportunity. Younger children more frequently commented, "I don't know how", or "My mother never lets me write", more generally ignored the request, or after a brief trial more quickly turned to something else. Often they responded with drawing rather than writing. Older children seemed proud of their ability to write.

At first the child seemed to wish only to imitate the adult's manner in rapid cursive writing, as shown by the hasty scribbling in an up and down motion progressing across the page. At about the four year level the children seemed to have discovered the separate letter units and to be more interested in forming those letter symbols.

Writing the last name came late in the age series and appeared to come rather suddenly. As soon as the first name had been successfully achieved, apparently the last name followed promptly with little difficulty. All the writing was done

by the children in capital letter form.

The improvement from level to level which is shown so graphically in these figures may be described somewhat as follows:

Level I, Figure 2 - Ages 3 to 3-6 years. Something beyond aimless scribbling appears at this level. There is considerable tendency toward the horizontal and some systematic "up and down" scratching, especially in the third sample.

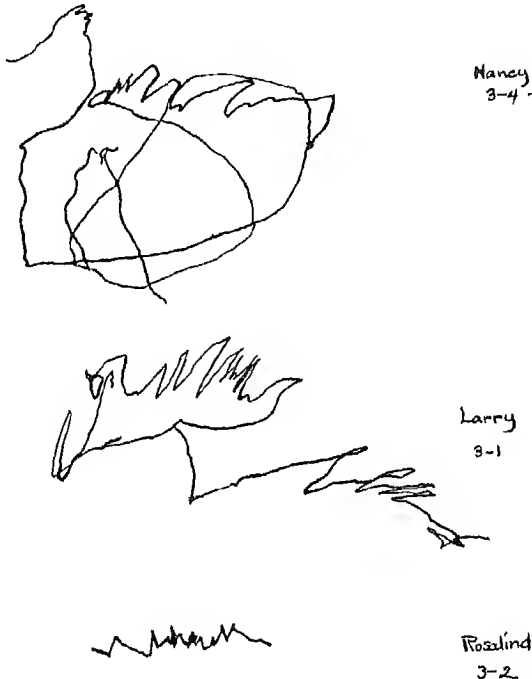
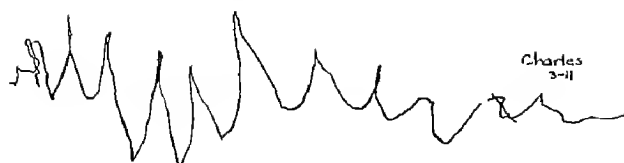


FIGURE II. NAME WRITING SAMPLES AGES 3-0 to 3-5

Level II, Figure 3 - Ages 3-6 to 3-11 years. The chief improvement here is the still greater tendency toward horizontal movement with greater regularity in the vertical strokes. There is some slight tendency to make discrete symbol units, though these are scarcely recognizable as letters.

Level III, Figure 4 - Ages 4-0 to 4-5. Separate symbol units become still more easily discerned. The waviness in imitation of adult cursive writing has almost ceased with the child's new recognition of the separate letter units. Occasionally a simple letter such as H or O is made correctly, but for the most part the letter units are not recognizable as such. There is more constriction in space.

Level IV, Figure 5 - Ages 4-6 to 4-11 years. At this level we find correctly




Charles
3-11



Katharine
3-10



David
3-7

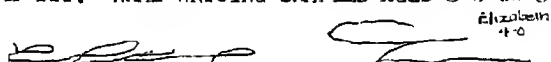


Catharine
3-6



Jim
3-10

FIGURE III. NAME WRITING SAMPLES AGES 3-6 to 3-11



Elizabeth
4-0



Judith
4-4



Sam 4-5



Harriet 4-4



Edna
4-3



Mary 4-1

FIGURE IV. NAME WRITING SAMPLES AGES 4-0 to 4-5

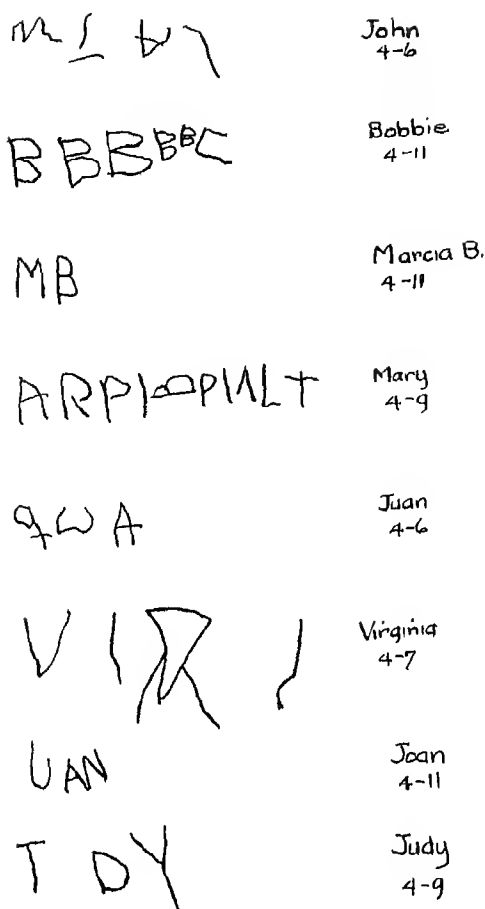


FIGURE V. NAME WRITING SAMPLES AGES 4-6 to 4-11

formed letters mixed with many incorrectly formed. There is little correct spelling of an entire name, letters are often omitted or rearranged. The letters written do not match the names very closely. This age range is definitely for these children a transition point in writing.

Level V, Figure 6 - Ages 5-0 to 5-6 years. Here we find correct spelling of a first name or nickname, but there are occasional reversals or letter malformations. There is more firmness in control, more regularity, more ease and rapidity shown in writing, and better alignment. The children find more pleasure and fun in writing.

Level VI, Figure 7 - Ages 5-6 to 5-11 years. Improvement in every respect is obvious. There are still occasional letter reversals. The writing from child to

JOHN John
5-0

HELEN Helen
5-0

BOBBIE Bobbie 5-2

ANNE Anne
5-2

DAVID David
5-3

RUTH Ruth
5-3

FIGURE VI. NAME WRITING SAMPLES AGES 5-0 to 5-5

JIMMY Jimmy
5-8

IRIS Iris
5-9

JOAN Joan
5-8

PETER Peter
5-7

ELINOR Elinor
5-8

YOUNG Young
5-8

JACK Jack
5-9

HELEN Helen
5-7

FIGURE VII. NAME WRITING SAMPLES AGES 5-6 to 5-11

child is more similar in style and more regular than formerly.

Level VII, Figure 8 - Ages 6-0 to 6-5 years. The chief improvement at this stage is in speed of writing. The consistency of results is surprising considering the small number of cases. Many of these children can also write their last names.

BILL	Bill 6-3
BROOKS	Brooks 6-4
SALLY	Sally 6-4
DONALD	Donald 6-0
LENORE	Lenore 6-0
HENRY	Henry 6-5

FIGURE VIII. NAME WRITING SAMPLES AGES 6-0 to 6-5

Testing beyond this point shows little improvement in capital letter writing. At this point too, school training usually enters to affect the product. There is steady improvement in attitude, speed, rhythm, adjustment, posture, motor control. All the age levels show wide range in writing maturity and there is considerable overlapping from group to group.

Range in intelligence seemed to be a major factor influencing range in quality and writing maturity within any half year age range. The influence of intelligence showed most clearly in extremes of the ability range.

Since these results are typical of children at the different age levels who test on an average of 120 I.Q., the question may be raised concerning results that would be obtained with children of average ability. In the case of average untaught children the chances are large that the same sequential levels in writing maturation would be found as in the case of these more intellectually gifted children. But maturation from stage to stage if not speeded up by formal teaching would undoubtedly take place more slowly. Lacking objective experimental data, the approximate age level at which the present levels would fit average children can be roughly estimated by multiplying each median age for each of the

groups whose results are reported here by 120. The obtained ages for the successive half year intervals beginning with 3-0 are:

3-6	6-0
4-2	6-6
4-8	7-2
5-4	7-8

These results may be considered tentative "norms" until data are obtained for comparable numbers of average children of the same chronological age.

One problem arises in attempting to test average children. That is the "interference" of school training in the case of children over five and a half years of age. By this age many normal children are enrolled in primary classes where instruction in writing, quite regardless of the maturity of the children, is undertaken. In order to make a comparable study children in the older age ranges could only be included who have received no school instruction in writing. At the six year level, particularly, such cases would be difficult to find.

Quantitative summary. Aside from the ratings, an attempt was made to summarize the results quantitatively, by counting the number of letters correctly made that actually occurred in the child's first and last name, at each age level. Only letters correctly orientated were counted correct. It may be objected that such a method of summarizing results would be unfair to particular children whose names were especially long or difficult to spell. Actually this limitation in the method is more apparent than real. Nicknames were usually substituted by the children for their real names when the latter were long, and in counting the final summary, the percentage correct rather than the number of letters correct was used.

Age Level, 3-0 to 3-5 (11 cases)

Scribble only, 5 cases
Scribble, characters or wavy line, 3
Circle, 1
Characters, 2

Age Level, 3-6 to 3-11 (19 cases)

Scribble only, 3
Scribble and characters or wavy line, 8
Separate characters, one or more, 7
Straight line, 1

Age Level, 4-0 to 4-5 (18 cases)

Refuses, 1
Wavy line, scribbles and characters, 8
Characters, 3
One letter correct and seven separate characters, 1

Age Level, 4-0 to 4-5 (18 cases) - Continued.

Correct letter formation,	100% - 2 cases
	80% - 1 case
	20% - 2 cases

Age Level, 4-6 to 4-11 (28 cases)

% correct	No. of cases	Last Name
100	7	
80	1	No - 25 cases
75	2	In part - 3 cases
66 2/3	1	
60	1	
50	6	
16 2/3	1	
0	9	

Age Level, 5-0 to 5-5 (24 cases)

% correct	No. of cases	Last Name
100	15	
80	1	No - 13 cases
75	1	Yes - 2 cases
43	1	In part - 4 cases
30	1	
12 1/2	1	
0	4	

Age Level, 5-6 to 5-11 (25 cases)

% correct	No. of cases	Last Name
100	17	
83	1	Yes - 8 cases
75	2	No - 15 cases
50	1	
16 2/3	2	
12	1	
0	1	

Age Level, 6-0 to 6-5 (23 cases)

% correct	No. of cases	Last Name
100	16	
87	1	Yes - 8 cases
80	2	No - 15 cases
75	1	
50	1	
33	1	

Age Level, 6-6 to 6-11 (21 cases)

% correct	No. of cases	Last Name
100	19	Yos - 16
14	1	No - 4
0	1	In part - 1

INFLUENCE OF TRAINING FACTORS

Variations from child to child in the different age levels is unquestionably due in part to differential training factors. In general the groups tested were fairly homogeneous with respect to economic status, social background, parental intelligence. These children come from the types of homes where A.B.C. blocks and books are commonplace, where children see the writing process carried on, where questions about writing and demands to write are intelligently answered.

In conversation with parents the response was quite general that when the children reach a certain stage in their maturity, they become interested in the writing process and make inquiries about it. They reach the point in their development where they very much want to imitate the adult's writing activities. They show insight and autocriticism of their own immature efforts and strive to improve. Improvement that results from this inner urge which is largely the result of maturation in a literate environment is fast or slow depending upon the child's learning ability, the interest he takes in the process, the stage of maturation he has reached when this interest is shown and the help he gets in recognizing and correcting his errors.

Parents generally reported that they had ordinarily answered the child's questions and given instruction when it was demanded but ordinarily had not wished the child to learn to read and write at an early age. No doubt the results for groups of less favored children would be analagous so far as serial order of learning as indicated by the name writing is concerned, but the various stages of progress would not appear so early in the child's career.

Parents questioned about the children's interest in writing almost universally commented that they had not taught the children to write, that on the contrary they had more often tried to discourage them from writing when they saw the amount of time being consumed in the exercise.

Apparently these children acquired their writing accomplishment by begging to know how to write when seeing others writing, and in response to the parent's suggestions as to how to form letters and to spell their names. Few of the children were apparently greatly embarrassed by their errors or recognize them fully before five and a half years of age. Name writing results from the child's interest in practicing, not solely from the child's being told how to do it. Parents reported that the children spent hours writing, but results were often unintelligible.

In explaining results the argument might be offered that increment in skill with age is solely the result of increasing amounts of instruction. There is no

evidence in favor of this argument at least until the age level of five and a half is reached and it is improbable that children are given more instruction in name writing at age four and a half than at age three. There is evidence however that the children increasingly practice writing through the preschool years and that as they mature they demand more help from their elders in achieving skill in writing.

The present study suggests others that could profitably be undertaken with children of preschool age:

- Sex differences in writing at these ages.
- Lateral orientation in beginning writing.
- Relation of handedness to skill and orientation.
- Relation of intelligence to handwriting quality within a narrow age range.

APPLICATIONS

The results, though highly tentative, lend themselves to two practical applications:

First, name writing in appropriate age levels may be used along with drawing, block play and other informal performance tests in evaluating the mental status of the subject. It constitutes a satisfactory non-language performance test. Writing constitutes a good motor and perception test among children who have had similar opportunities to observe and practice the writing of number and letter symbols. Barring special training involving regular and closely supervised practice, the extent to which the child below six years of age is able to write his name is an indication of mental maturity. Maturation in name writing parallels speech refinement, refinement in perception, improvement in drawing, and number ability that occurs between the ages of three and six.

The norms to be used as reference points for evaluation of writing would be the converted ages reported above, rather than the median results for gifted children.

In interpreting results for purposes of mental diagnosis, evaluation of intellectual abilities and mental maturity, it is important to take the training factor into consideration. To do this it is usually necessary to inquire of the parent how much interest the child has shown in writing, what his opportunities to write have been, and what the parent's response has been to the child's request to write; whether the child has had formal writing instruction in school classes or with teacher at home.

In the second place, the results suggest the importance of knowing something about the child's writing maturity before formal instruction is given. We may assume that children of six who have barely reached the second or third stages pictured in the graphs deserve a somewhat longer exploratory period with pencil and paper, letters and numbers before formal writing especially in cursive style is begun. Since children invariably write in capital letter style before they

receive formal instruction and achieve a high degree of skill in this writing style, it would be logical to continue with print script (lower case letter) style for a period of time before cursive writing is taught. By this means better continuity between the child's first primitive writing efforts and more mature writing stages would be maintained. Preservation of this continuity would seem to be essential in maintaining the child's interest in writing and in contributing to his general school adjustments. Instruction could thus proceed more effortlessly and the children respond more spontaneously than they now do when first taught "penmanship".

REFERENCES

- (1) Biber, B. Children's drawings: From lines to pictures. Bureau of Educational Experiments, New York: 1934.
- (2) Gordon, H. Left-handedness and mirror writing. *Brain*, 1920, 43, 313-368.
- (3) Hildreth, G. H. The success of young children in letter and number construction. *Child Development*, 1932, 3, 1-14.
- (4) Hornig, R. Zeichen- und Schreibphänomene bei Elementarschulern. *Ztschr. f. Angew. Psychol.*, 1910, 3, 541-545.
- (5) Legrün, A. Wie und Was "geschrieben" Kindergartenkinder. *Ztschr. f. pädagog. Psychol.*, 1932, 33, 322-331.
- (6) Luquet, G. H. *Les dessins d'un Enfant*. Paris: Felix Alcan, 1913.
- (7) Monroe, M. The drawings and color choices of young children. Abstracts of theses, Humanistic Series, University of Chicago, 1928-1929, 7.
- (8) Montessori, M. *The Montessori method*. New York: Stokes, 1912. Chapters 16 and 17.
- (9) Neitz, M. *Handwriting of kindergarten children*. Master's essay, Northwestern University, 1933.
- (10) Stern, W. *Psychologie der Frühen Kindheit*. Leipzig: Quelle und Meyer, 1930 (6th ed.), 147-149.

RORSCHACH TEST NORMS OF YOUNG CHILDREN

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As it becomes increasingly clear that learning depends fundamentally on personality as well as on intelligence, it seems important to ascertain how early such traits can be established, what different forms they assume, and how teaching must be adapted to these variations in order to make acceptable achievement less difficult and less hampered by individual peculiarities. These investigations of young children utilize the common forms of intelligence and performance tests and also the personality measurements adaptable, especially the Rorschach Diagnostik. This latter test can be used with precocious 2-3 year old children and with average children as early as 4-5 years. It is helpful with youngsters who are negativistic, since they are more willing to give verbal responses to these unusual pictures than to any other test-material. This test is also an instrument for demarcating intelligence from verbosity and verbal fluency. It is, furthermore, an aid in revealing the unusual cases of creative imagination where intelligence and performance scores are only average or even inferior. Moreover, it might be worthwhile to investigate whether a technique which discloses the factors involved in an ill-balanced adult personality could indicate early in the life of children the beginnings of such unfavorable tendencies. If it were possible to differentiate in childhood between neurotic and psychotic trends, more definite methods of remedy might be found. Finally, in such studies of young children there might be suggestions for wider observations and an answer to the question as to stable personality patterns. The immediate objective of this inquiry is to find norms that can be utilized for further comparisons between different social-racial groups. This report gives the general statistical results of the Rorschach test administered to 3 groups of children of different social status and more detailed analysis of the Rorschach Form, considered as form-perception, one of the 4 psychological processes constituting personality according to this test. This point of view has been so ably elaborated by Dr. S. J. Beck (*Am.J. of Psychiatry* XIII, 3, 1933) that there is no need of discussing it here.

The 3 groups that furnished the data for these results were distributed as follows: 1855 White Children (871 boys and 784 girls) and 2068 Negro children (1042 boys and 1026 girls) were pupils in Nursery, Kindergarten and First Grade in New Orleans; 712 Southern Mountain children (339 boys and 373 girls), all primary pupils. The proportion of overage Mountain children in the first grade was so much larger than in the other two groups that the siblings in all the primary grades were included in order to note possible effects of more extensive schooling. In recent government publications issued by Everett Edwards of the Department of Agriculture it is asserted that "there are at least 3 distinct social classes in the Southern Appalachian region. One group is found in the valleys of the creeks and rivers where the soil is comparatively rich, the water supply satisfactory, and communication relatively easy...The second group lives along the streams where the valleys are narrower, the hills higher and steeper, and the soil poorer and thinner." The third group are the Cove people, living "where slopes are steepest

¹ Andrews, North Carolina.

and soil poorest." The Mountain children discussed in this report belong predominantly to the two less favored groups. On account of the many opportunities offered by an urban environment to offset deficiencies of meagre home training, a lack which in the Mountain community is partially supplied by the school, the second division of overage children (8 year-plus in the tables) are the pupils who have had several years of schooling in the primary grades.

The mental ages obtained from both Stanford Revision and Yerkes Point Scales indicate according to the means fairly similar intelligence levels for the majority of the children in each of the 3 groups tested. The results given under MAN are ages from the Goodenough scale and the ratings of the Mountain group are lower at all year-levels than those of the other groups. This group also ranked lower on the performance tests, but the results are too varied to be summarized in a brief statement. When the children are given the opportunity of trying out the whole Yerkes scale as far as they can, the scores are consistently higher at all year-levels in all 3 groups than those from the Stanford Revision.

TABLE I

The mean scores for chronological age, mental age by Stanford Revision - M.A.-S and Yerkes Point M.A.-Y, Goodenough Drawing of Man Scale M.A.-G and the Rorschach scores. M - movement. C - color. Cs - specific colors. Ar.Spat. - spatial features in noun forms. Ar. - constructional forms. O - objects. Os - minor categories.

No.	Mental Age				Av.Range	M	Rorschach							
	C.A.	M.A.-S	M.A.-Y	M.A.G			C	Cs	Ar,Spat.	Ar.	O	Os		
White Boys														
171	4-7.3	5-4.6	5.5	4-11	45.9(13-74)	1.6	2.3	3.1	5.1	2.1	1.5	9.3		
375	5-6	6-2	6.1	5-11	55.4(13-102)	1.8	2.4	3.5	5.9	1.7	1.3	10.9		
221	6-5	6-11	7.6	6-3.3	58.6(26-122)	2.0	2.9	5.0	7.9	1.7	1.1	11.9		
56	7-4.7	7-0	7.4	6-5.6	55.7(35-94)	1.4	3.3	4.9	8.5	1.4	0.8	11.3		
48	11-0	8-6.8	8.8	8-0	57.7(25-95)	1.4	2.0	3.0	6.3	1.0	0.5	11.3		
White Girls														
145	4-6.6	5-4	5.6	5-3	46.0(22-83)	1.4	2.4	4.6	5.8	1.9	2.1	10.6		
356	5-5.2	6-1.7	6.5	6-0	55.1(17-110)	1.6	2.4	4.5	6.2	2.0	1.0	11.1		
209	6-4.5	6-6	7.0	6-1	53.4(22-130)	1.6	2.8	5.1	6.7	1.7	1.1	11.1		
29	7-4.1	7-0	7.8	6-9.5	58.3(33-83)	1.4	2.5	3.1	10.2	2.4	0.5	15.2		
45	10-4	8-2	8.9	7-9.6	58.1(22-130)	1.0	2.9	5.4	8.0	1.0	1.0	10.8		
Negro Boys														
28	4-8.9	5-1	5.3	5-4.6	42.8(21-74)	1.4	2.4	3.8	4.0	1.9	1.9	7.2		
237	5-7	5-11	6.1	5-7.1	55.1(24-101)	2.1	2.8	4.9	7.8	1.8	2.1	10.7		
364	6-5.6	6-1.8	6.6	6-1	54.9(17-112)	1.8	3.1	5.2	7.8	1.8	1.4	9.5		
246	7-4.6	7-0	7.1	6-5.6	59.1(25-103)	2.2	2.9	4.8	7.5	1.4	1.4	8.1		
167	9-0	7-5	7.7	7-2	62.8(21-118)	2.2	2.9	4.8	8.6	1.2	1.0	6.2		

That is, the girls tend to respond with a slightly larger proportion of the minor categories than do the boys.

TABLE II

Mean Scores for Rorschach Form Categories - Ar. - architectural. C - color. P - personalities. A. - animals. At. - anatomical. Nat. - nature. App. - apparel. Hld. - household. Imp. - implements. Verb. - verbal. Sch. - school. V. - vehicles. Mt. - Mountain.

Ar. C. P. A. At. Nat. App. Spat Hld. Imp. Food V. Toy Sch. Verb Totals

White Boys

1.1	0.4	1.7	7.7	2.6	4.9	0.5	0.45	0.2	0.2	0.15	0.1	1.1	0.08	0.05	20.4
0.6	0.3	1.6	8.5	3.3	5.4	0.6	0.6	0.26	0.25	0.2	0.1	0.1	0.1	0.1	22.9
0.5	0.3	1.5	8.3	4.7	5.1	0.7	0.2	0.2	0.2	0.1	0.1	0.05	0.1	0.1	22.5
0.3	0.1	1.8	8.2	4.5	5.3	0.35	0.8	0.1	0.2	0.05	0.04	0.1	0.02	0.1	21.8
0.4	0.1	1.2	1.4	5.1	4.3	0.3	1.5	0.2	0.1	0.1	-	0.1	0.1	0.1	25.8

White Girls

1.0	0.5	2.1	8.8	2.8	5.0	0.6	0.35	0.2	0.15	0.3	1.1	0.15	0.05	0.1	22.5
0.9	0.5	1.8	9.3	3.8	5.5	0.9	0.8	0.26	0.2	0.2	0.03	0.1	0.1	0.2	23.8
0.55	0.5	1.7	8.3	0.4	4.25	0.7	0.8	0.3	0.1	0.3	0.05	0.1	0.01	0.2	21.8
0.5	0.2	2.1	9.3	3.9	5.1	1.0	1.2	0.3	0.2	0.1	-	1.1	0.03	1.7	24.2
0.3	0.4	2.4	8.5	6.3	3.6	0.7	0.8	0.2	0.2	0.1	-	0.1	0.02	1.9	23.8

Negro Boys

1.0	0.2	2.0	7.5	1.8	4.6	0.6	0.3	0.3	0.5	0.25	0.1	0.1	1.4	-	19.2
0.9	0.3	2.9	8.4	3.8	6.8	0.75	1.04	0.4	0.4	0.3	0.13	0.24	0.1	0.1	26.6
0.7	0.2	2.2	7.7	3.8	6.6	0.6	1.0	0.3	0.3	0.2	0.1	0.13	0.04	0.1	24.0
0.6	0.1	2.4	8.1	5.1	6.6	0.6	1.1	0.3	0.25	0.2	0.1	0.13	0.04	0.1	25.5
0.4	0.25	2.8	9.1	6.4	6.1	0.5	1.0	0.2	0.3	0.13	0.1	0.04	0.1	0.1	27.9

Negro Girls

0.8	0.15	2.5	6.9	2.7	7.5	0.9	1.4	0.3	0.2	0.6	0.03	0.03	0.03	-	24.0
1.0	0.3	2.8	7.4	4.1	6.3	0.9	1.0	0.6	0.3	0.4	0.06	0.2	0.07	0.14	25.4
0.6	0.25	2.3	7.6	5.0	6.4	0.8	1.4	0.35	0.24	0.24	0.6	0.15	0.05	0.1	25.4
0.45	0.23	2.6	8.0	5.1	6.4	0.8	0.9	0.4	0.2	0.3	0.02	0.1	0.02	0.1	25.6
0.5	0.2	2.4	8.4	6.3	6.5	0.65	1.1	0.3	0.2	0.06	0.01	0.1	0.03	0.1	26.8

Mountain Boys

0.4	0.05	1.9	8.7	8.8	7.5	0.4	1.1	0.13	0.15	0.26	0.1	0.1	0.05	0.05	29.6
0.35	0.1	1.8	9.2	9.3	7.1	0.5	1.3	0.5	0.3	0.1	0.1	0.1	0.1	0.1	31.2
0.4	0.14	2.5	7.8	10.3	9.4	0.6	1.3	0.4	0.1	0.2	0.1	0.04	-	0.01	33.2
0.5	0.2	2.7	9.5	12.2	8.5	1.1	1.6	0.5	0.1	0.1	0.1	0.04	0.02	0.1	37.5

TABLE I (Concluded)

No.	C.A.	Mental Age			Av. Range	M	Rorschach						
		M.A.-S	M.A.-Y	M.A.-G			C	Cs	Ar.	Spat.	Ar.	O	Os
Negro Girls													
34	4-8.4	5-7.4	5.4	5-1	48.8(23-82)	1.03	3.2	5.1	6.8	1.9	2.2	10.1	
263	5-7.7	6-0	6.3	5-8	61.2(25-117)	1.9	3.3	6.3	9.0	2.1	1.8	9.7	
344	6-5.6	6-5	6.6	5-9.5	58.5(27-132)	1.7	3.2	5.7	8.2	1.6	1.7	10.4	
226	7-4.8	6-10	7.1	6-5	57.8(30-97)	1.7	3.0	5.2	7.5	1.3	1.4	9.8	
159	9-0	7-0	7.6	7-0	64.4(25-119)	1.7	2.3	4.3	8.1	1.2	1.2	9.0	
Mountain Boys													
7	5-11	5-8	6.2	5-4	51.7(22-85)	1.0	3.0	4.0	8.2	1.7	0.3	10.0	
54	6-6	6-3	6.6	6-4	65.0(28-152)	0.9	2.3	3.2	6.2	1.2	0.4	9.3	
71	7-5	6-4	7.3	6-8	69.1(31-126)	1.2	2.8	4.3	6.8	1.1	0.5	11.1	
87	10-0	7-6	7.9	6-9	72.5(26-121)	1.1	2.4	5.2	7.1	0.9	0.6	9.9	
126	10.7	8-9	9.1	7-3	85.1(28-143)	1.3	2.5	3.8	7.2	1.4	0.6	12.4	
Mountain Girls													
8	5-9	5-7.5	6.1	5-4	55.9(30-84)	0.8	2.9	4.3	4.8	2.1	1.5	9.8	
63	6-6	6-4	6.6	6-1	64.0(30-110)	1.2	2.9	5.4	8.7	1.4	1.1	12.9	
72	7-9	7-6	7.4	6-4	67.9(33-118)	1.1	2.5	3.7	8.4	2.2	0.6	11.2	
70	9-0	7-7	8.1	6-8	69.6(22-127)	1.1	2.2	3.8	7.3	1.4	0.3	9.8	
167	10-6	8-9	9.2	7-9	82.5(26-159)	1.6	2.7	4.2	10.7	1.5	0.8	14.1	

As far as possible the Rorschach categories were retained but others had to be added to make the summary complete and some changes were made to give due emphasis to individual variations that seem significant. In all the groups 3 large classifications are outstanding: Animals (A.), Anatomical parts (At.), and Nature (Nat.). The term "Botanical" is of little use; less than a half dozen trees were specifically named in any of the groups, and rose was the only flower mentioned several times and dahlia and lily each once. If every idea suggested by the pictures is counted only once, irrespective of the number of times it is given by the same child or by many children, these 3 classes comprise from 79% to 91% of all the individual ideas (White group 909; Negro 871; Mountain group 566). The lowest percentages belong to the Negro 4-5 year-olds, and the highest to the first grade 8+ year Mountain children. In other words, from the standpoint of variety of categories, the former are the most original and the latter the least. There is a consistent tendency for the girls at all ages in every group to have smaller percentages than the boys by even larger amounts than are indicated in the following summary:

All Boys	All Girls	Totals
White 87% Negro 85.3% Mt. 86.6%	White 84% Negro 84% Mt. 87.1%	B. 86.5% G. 85.7%

TABLE II (Concluded)

Ar. C. P. A. At. Nat. App. Spat Hld. Imp. Food V. Toy Sch. Verb Totals

Mountain Girls

0.4	0.2	2.1	7.3	7.5	8.3	0.7	1.3	0.5	0.13	0.1	0.1	0.1	-	0.14	29.2
0.7	0.5	2.2	7.6	9.0	8.5	1.2	1.2	1.4	0.24	0.15	0.15	0.1	0.2	0.1	32.3
0.4	0.14	2.5	7.8	10.3	9.4	0.6	1.2	0.4	0.1	0.17	0.13	0.04	-	0.01	33.2
0.5	0.23	2.7	9.5	12.2	8.5	1.1	1.6	0.5	0.1	0.13	0.01	0.04	0.02	0.1	37.5

In the tables color (C.) indicates in how many pictures each child mentioned color, including blood, fire and similar equivalents. Colors specifically named, each color mentioned counted only once for the same picture, irrespective of how many parts were so described, are designated Cs. The abbreviation Ar. stands for architectural and constructional masses and materials and Spat. for such spatial features as line, stripe, hole, given in noun-form so that this category conforms strictly to the others. When interpretation of the results was attempted, it was found that spatial relations expressed in prepositional phrases had great significance and hence these were also taken into account in arriving at the final scores. From observation of the children and reports of their behavior as well as from the other tests, these Ar.-Spat. categories seemed empirically, at least, to be an index of personality, so more detailed tabulations have been set forth.

It seemed impossible to determine whether from the children's standpoint such beings as St. Claus, Giant, Elf, Deity should be regarded as human or not, so all these and similar personifications and proper names as well as humans are included in the abbreviation P. All kinds of apparel come under App., and ordinary objects of the household under Hld. All other implements and instruments have been classed as Imp. Food covers drinks as well as eats, and all kinds of vegetation known to the children principally as eatables are placed here instead of under Nature. The category vehicles (V.) has the special interest of perhaps showing some bearing of automobiles and airplanes on the form-perception of different children. Objects that the children come in contact with only or mainly in school are listed as Sch. and responses as picture, ink, puzzle are called verbal. Excluding the 3 major categories together with C. and P., these 10 minor categories that make up a very small percentage of the totals, have been combined under the term O's, so that comparison can be made without the handicap of local differences and personal idiosyncrasies which may make the determination of the exact categories ambiguous or impossible.

As far as possible, the experience and meaning implied by the children were the criteria of the classification. To the urban groups, brush is an implement; to the Mountain children a familiar part of nature. To the former, knob is a part of a door; to the latter, a part of a tree or of a mountain. The city children buy a snowball at the counter, the Mountain boys and girls make theirs when the snow falls. On the other hand, the same stuff is tallow for the Mountain children and wax for the Negro. It is also disconcerting to get such terms as scorpion, tonsils, brains, and entrails as equally frequent responses from Mountain young-

sters and from Negro and to hear that germs are seen in the picture by 5 year-olds, both Negro and White. Of the total number of individual responses given by these children, the Mountain group contribute 114 words not used by either of the other groups, the White 149, and the Negro 176.

A striking feature of the Rorschach test is the close similarity at all year-levels of the means of the majority of categories, the experimental coefficient of unreliability ranging from 0 to 32 in most cases. The same patterns occur from the fourth year on thru the different chronological and mental ages, and a considerable number of retests indicate a stability of these patterns as great as that of the I. Q. The responses from the earliest ages of testing take the forms of all the major and most of the minor categories. There is an increase in the sum total of responses, according to age, both in amount and range, but it is doubtful that the number of individual ideas contributed increase at the same pace. There is a tendency toward greater wordiness on the part of the older children and a repetition of the same idea thruout the whole series. Exaggerated verbosity and repetition is to a larger extent characteristic of the Mountain children, even of the youngest as can be seen from the large totals and the small number of individual ideas. Responses of Movement, Color, and Spatial Relations increase with age, and 'particularly responses of Anatomical Parts.' This is also the one category where the difference between the Mountain children and the other groups is definitely valid statistically. Even in the case of individual ideas, this category furnishes 14% of the total for the Mountain group as compared with 8% for the Negro and White. In the whole series less than 8% of the Mountain group omit mention of some anatomical or physiological aspect, but over 18% of Negro and White make such omission. One half or more of all the responses given belong to this category in 15-20% of the Mountain group, but in only 2% of the White and Negro. On the other hand, less than 3% of all the groups omit mention of animals, and about 7% of nature. Less than one third of the White and Negro children omit movement, 40-50% of the Mountain; about 25% of the latter give no Color response, about 20% of the White, and approximately 15% of the Negro children. It is also of interest that many of the Movement responses of White and Negro children are play activities, while no such reference occurs in the Mountain group.

The major categories, Animals and Nature, have been selected for analysis of distribution, as the latter illustrates the concentration upon one outstanding item while in the former the frequencies are somewhat more evenly distributed among the different animals; the third major category (At.) conforms to this type also. The percentages were calculated on the total of the selected items rather than on the whole category total, since it was assumed that thus a comparison fairer to all the groups could be achieved. As usual the sex differences are dubious: a slight trend for the boys to favor bear and the girls to prefer dog and rabbit. There is a tendency for bear and snake to become more frequent with increasing age, and for cat, cow, dog, horse, monkey to become less so as they are replaced by a greater variety of animals with the maturing experience and discrimination of the children. As to the different groups, all 3 agree on giving most often, tho with varying emphasis, butterfly, dog, rabbit, bird and bear, while the Negro group is peculiar in the greater frequency of cat as well as of dog. On account of the many animals mentioned only once or twice, it is futile to attempt a summary of those of least frequency.

TABLE III

Ar.	c.	P.	A.	At.	Nat.	App.	Spat.	Hld.	Imp.	Food	V.	Toy	Sch.	Verb.
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White Boys

5.0	2.1	8.0	37	13	24	2.5	2.2	1.1	1.0	0.7	0.6	0.5	0.3	0.2
3.0	1.4	7.0	36	15	24	3.0	3.0	1.2	1.2	0.8	0.3	0.5	0.3	0.4
2.2	1.2	7.0	37	21	23	2.2	3.0	0.7	0.8	0.8	0.3	0.3	0.2	0.3
1.4	0.3	8.5	37	20	25	1.6	3.7	0.4	1.0	0.2	0.1	0.4	0.1	0.4
1.6	0.5	8.5	44	19	17	1.0	4.0	1.0	0.5	0.5	-	0.3	0.5	0.5

White Girls

4.4	2.3	10.0	39	13	23	1.6	1.6	0.9	0.7	1.4	0.4	0.7	0.25	0.6
4.0	2.0	7.6	39	15	21	3.6	3.4	1.1	0.8	0.7	0.01	0.5	0.3	0.6
2.5	2.0	8.0	38	18	19	3.4	3.5	1.4	0.5	1.2	0.2	0.4	0.1	0.6
2.0	0.1	9.0	36	16	21	4.2	5.5	1.1	1.0	0.1	-	0.1	0.1	1.1
1.0	1.6	10.0	36	27	15	3.0	3.5	1.0	1.0	0.3	-	0.3	0.1	1.0

Negro Boys

5.0	1.2	10.0	39	9.3	24	3.0	1.5	1.5	2.6	1.3	0.1	0.1	0.1	-
3.3	1.0	11.0	32	15	26	3.0	4.0	1.5	1.6	1.1	0.5	0.9	0.3	0.2
3.0	0.9	9.3	32	16	28	2.6	4.0	1.2	1.2	0.9	0.4	0.6	0.2	0.3
2.4	0.4	9.5	31	20	26	2.2	4.0	1.0	1.0	0.7	0.3	0.3	0.4	0.5
1.5	0.9	10.0	33	23	22	2.0	3.5	0.7	1.0	0.5	0.3	0.2	0.33	0.3

Negro Girls

3.6	0.5	10.3	28	11	31	4.0	6.0	1.3	0.8	2.5	0.1	0.1	0.1	-
4.0	1.2	11.0	29	16	25	3.3	3.8	2.2	1.5	1.6	0.2	0.7	0.3	0.5
2.3	1.0	9.0	29	20	25	3.3	5.5	1.4	1.1	1.0	0.24	0.6	0.2	0.3
1.7	0.9	10.0	31	20	25	3.0	3.5	1.6	0.5	0.9	0.1	0.5	0.1	0.3
2.0	0.7	9.0	31	23	24	2.3	4.0	1.0	0.8	0.2	0.1	0.2	0.1	0.2

Mountain Boys

0.3	0.2	4.4	29	30	25	1.4	3.6	0.5	0.5	0.8	0.3	0.3		
1.1	0.4	5.7	29	29	22	1.7	4.2	1.7	0.7	0.4	0.2	0.2	0.2	0.2
0.8	0.2	7.0	23	35	24	2.2	4.5	0.5	0.3	0.8	0.2	0.1	0.1	0.1
1.2	0.4	6.0	24	35	22	1.4	6.0	0.8	0.8	0.4	0.1	0.1	0.1	0.4

Mountain Girls

1.3	0.7	7.0	25	26	28	2.0	4.5	1.8	0.4	0.5	0.3	0.2	-	0.5
2.3	1.5	7.0	24	28	27	3.7	5.0	0.7	0.5	0.4	0.3	0.5	0.1	0.3
1.3	9.4	7.6	24	32	29	2.0	3.6	1.0	0.3	0.5	0.4	0.5	-	0.1
1.4	0.6	7.0	26	33	23	3.0	4.0	1.3	0.3	0.3	0.1	0.1	0.1	0.2

TABLE IV

Percentages of total Rorschach scores for animals named most frequently.

	Boys			Girls			Total		
	White	Negro	Mountain	White	Negro	Mountain	Boys	Girls	Group
Bat	1.0	0.5	3.3	0.8	0.1	2.3	1.1	0.8	1.0
Bear	11.0	5.5	12.5	9.5	3.0	10.0	8.6	6.4	7.6
Bee	2.8	0.8	1.0	2.8	1.0	1.3	1.6	1.6	1.6
Bird	11.0	7.0	9.3	12.0	7.0	7.0	9.0	8.8	9.0
Bfly.	27.0	18.0	21.0	24.0	18.0	24.0	22.0	21.0	22.0
Cat	2.5	6.0	4.7	4.5	8.0	5.0	4.5	6.1	5.3
Chicken	3.3	4.4	3.3	2.2	4.0	5.2	3.8	3.5	3.7
Cow	1.1	1.8	1.0	1.0	1.3	1.3	1.4	1.2	1.3
Crab	4.2	5.0	0.6	4.0	5.0	0.4	4.0	4.0	4.0
Crawfish	1.0	0.7	1.7	1.3	1.0	1.2	1.0	1.1	1.0
Dog	8.7	16.5	11.0	12.0	17.0	11.0	13.0	13.0	13.0
Horse	2.8	5.4	2.0	2.6	5.0	2.5	3.8	3.7	4.0
Monkey	4.7	5.1	2.0	5.4	6.4	1.3	4.4	5.1	5.0
Rabbit	6.2	10.0	12.0	8.8	9.4	11.0	8.9	9.3	9.0
Rat	5.6	5.0	4.0	3.0	5.0	2.7	4.6	4.0	4.3
Snake	3.8	5.2	5.0	4.3	3.7	5.5	4.6	4.2	4.5
Spider	3.2	3.2	2.7	1.7	2.8	2.8	3.0	2.3	2.7
Squirrel	1.0	0.9	3.2	0.8	0.8	3.2	1.3	1.2	1.2

TABLE V

Percentages of total Rorschach scores for nature items named most frequently.

	Boys			Girls			Total		
	White	Negro	Mountain	White	Negro	Mountain	Boys	Girls	Group
Air	1.0	1.2	0.3	0.5	1.0	0.5	0.9	0.7	0.85
Branch	1.0	1.2	0.7	1.0	0.5	0.7	1.1	0.7	0.9
Cloud	6.0	7.0	12.0	4.0	5.0	11.0	7.8	6.0	7.0
Dirt	6.2	1.7	0.7	2.0	0.9	0.1	1.9	1.0	1.4
Fire	13.0	6.3	6.7	9.0	7.5	6.0	8.5	7.7	8.0
Flower	10.0	7.0	6.3	10.0	8.7	6.8	7.7	8.8	8.0
Grass	1.3	1.0	1.0	1.5	1.0	1.4	1.2	1.2	1.2
Ground	1.6	1.6	1.5	1.0	1.3	1.7	1.6	1.3	1.5
Ice	0.5	0.3	0.7	0.7	0.2	0.6	0.5	0.4	0.45
Leaf	3.0	5.5	8.0	2.0	5.4	7.0	5.5	5.0	5.1
Limb	0.3	1.0	8.0	0.5	0.8	7.0	2.1	2.0	2.1
Moon	1.0	1.2	0.3	1.4	2.0	0.8	1.0	1.6	1.3
Rain	0.5	0.2	0.1	0.7	0.2	0.2	0.3	0.4	0.4
River	0.3	0.2	1.5	0.5	0.3	1.3	0.5	0.6	0.6
Rock	2.0	0.7	5.0	2.0	0.5	5.5	2.7	2.0	2.0
Sky	7.0	13.0	3.7	9.0	14.0	5.0	9.5	11.0	10.5
Smoke	4.0	4.0	2.0	5.0	5.4	3.5	3.7	5.0	4.4

TABLE V - Concluded.

Percentages of total Rorschach scores for nature items named most frequently.

	Boys			Girls			Total		
	White	Negro	Mountain	White	Negro	Mountain	Boys	Girls	Group
Snow	4.0	0.8	1.6	5.0	1.5	2.0	2.0	2.4	2.2
Sun	1.4	0.7	1.4	1.5	0.5	1.5	1.0	1.0	1.0
Tree	32.0	36.0	32.0	32.0	33.0	32.0	35.0	35.0	35.0
Water	7.6	9.0	5.0	10.0	5.4	7.0	7.8	7.0	7.5

In the Nature category tree is significant not only by the preponderant frequency, but by the equal weight given to it by urban as well as by Mountain children. When the living conditions of these groups are compared, the interest of the Negro children in tree, air, leaf, flower, moon and cloud is worth consideration. The groups as a whole mention most frequently tree, sky, fire, flower, water and cloud. The boys are inclined to emphasize branch, cloud, dirt, fire, leaf, rock and water; the girls to stress flower, moon, sky, smoke and snow.

There is general agreement as to the pictures which most readily suggest the various form-perceptions; the few discrepancies may be accounted for by the few responses of that type. Picture I. suggests only flying animals; so does also V, with the exception of horse in the case of younger children. The other animals may appear in any of the other 8 pictures, tho some seem more potent than the rest to suggest specific ones regardless of age and sex. In the nature series, picture I does not suggest rain, grass, ground, and river, nor V. rock, river and sun. On the other hand, all the pictures may suggest cloud, flower, ice, leaf, sky, smoke, tree and water. The pictures especially suggestive of certain animals and phases of nature are listed below.

Bat	I.V.	Air	II.III.VI.VII.	Smoke	IV.VI.VII.
Bear	VIII.	Branch	V.IX.X.	Sun	II.IX.X.
Bee	V.X.	Cloud	II.VII.IX.X.	Tree	IV.VI.VIII.IX.X.
Bird	I.III.V.X.	Dirt	VI.VII.	Water	II.III.VII.VIII.IX.X.
Butterfly	III.V.X.	Fire	II.III.IX.X.		
Cat	III.VI.VIII	Flower	IV.VIII.IX.X.		
Chicken	II.III.	Grass	VII.IX.X.		
Crab	X.	Ground	VIII.IX.X.		
Dog	II.III.VII.	Ice	II.VII.VIII.		
Horse	III.IV.V.	Leaf	I.VI.VII.IX.X.		
Monkey	III.X.	Limb	IX.X.		
Mouse, Rat	VIII.	Moon	VII.IX.X.		
Rabbit	V.X.	Rain	III.VII.IX.		
Snake	III.IV.VI.X.	River	VII.IX.		
Spider	X.	Rock	VII.CIII.IX.		
Squirrel	VIII.	Sky	I.VIII.IX.X.		

For these 3 groups of children, according to the number of individual ideas called forth, pictures X.III.II. suggest the most form-perceptions and I. and V. the least, the other 5 ranging in varying order in between. The totals vary from over 4000 for X. to less than half of that for V. The Negro group find VI. the most stimulating of the middle 5 pictures (instead of VIII. as do the White and Mountain groups) while to the White children this is the least suggestive. The difference in the emotional effect of color, more pronounced in the Negro group, may account for this divergence.

This partial report of results of the Rorschach test has not attempted to describe complete diagnostic performances and the emphasis on a few numerical findings does not imply that statistical procedure gives the final estimate, but without such standards the results of a few limited cases of diagnosis may be over or undervalued, and what is a type pattern may be regarded as unique. For instance, the examiner of these children has been definitely impressed that the mention of rock, stone, cliff and architectural and constructional forms in response to some pictures is indicative of very severe inhibition, but that responses of these terms thruout the series may or may not be such an index. Only further examinations of children characterized by such restraint can bring definite evidence that these or other test elements are the crucial ones. Furthermore, whether the categories in all connections and proportions relative to the others reveal the same psychological processes, whether the categories have the same values for younger children as for adults, whether the personality patterns remain stable from the beginning, these and similar questions can be conclusively answered only by numerous comparisons of children living in different social-racial environments.

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